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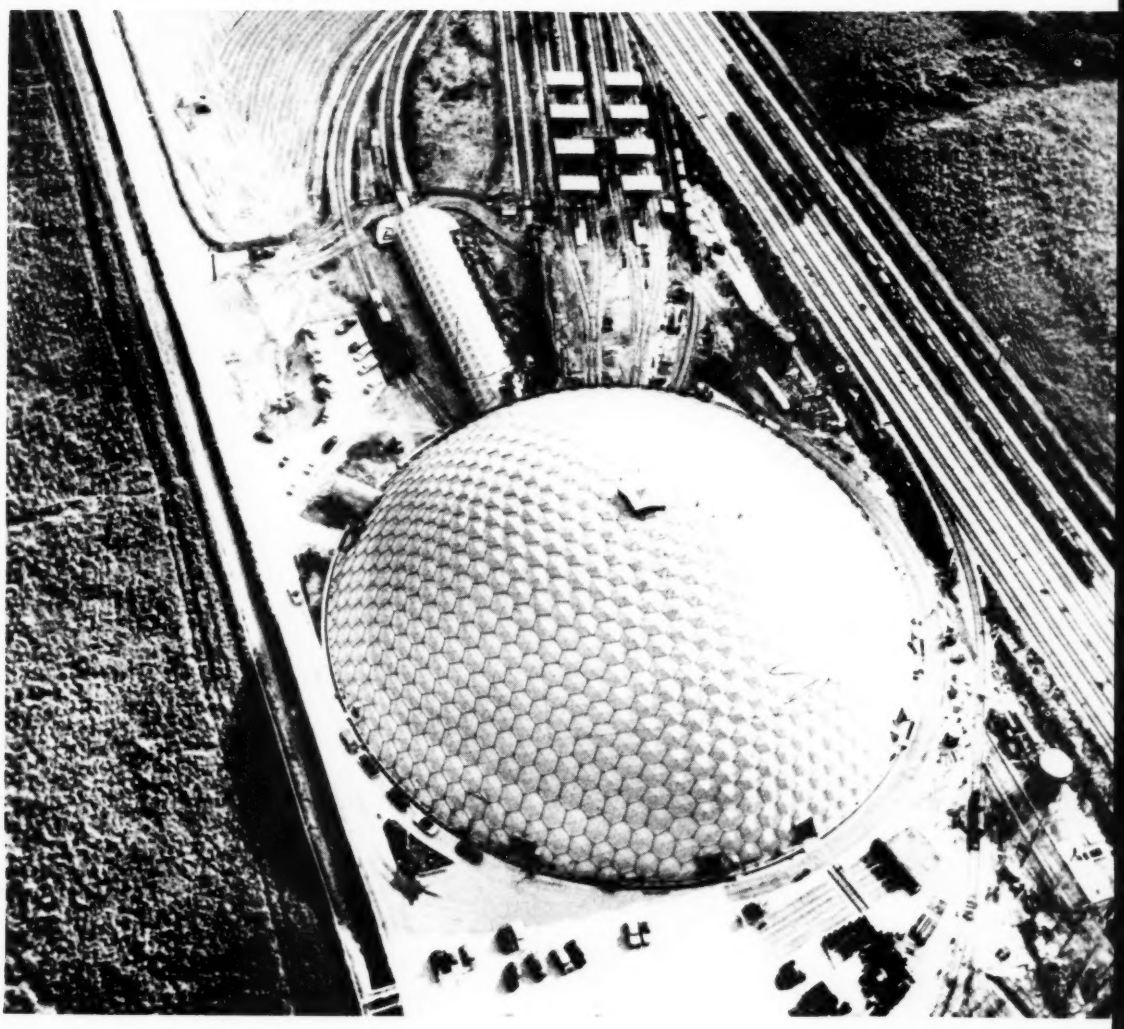

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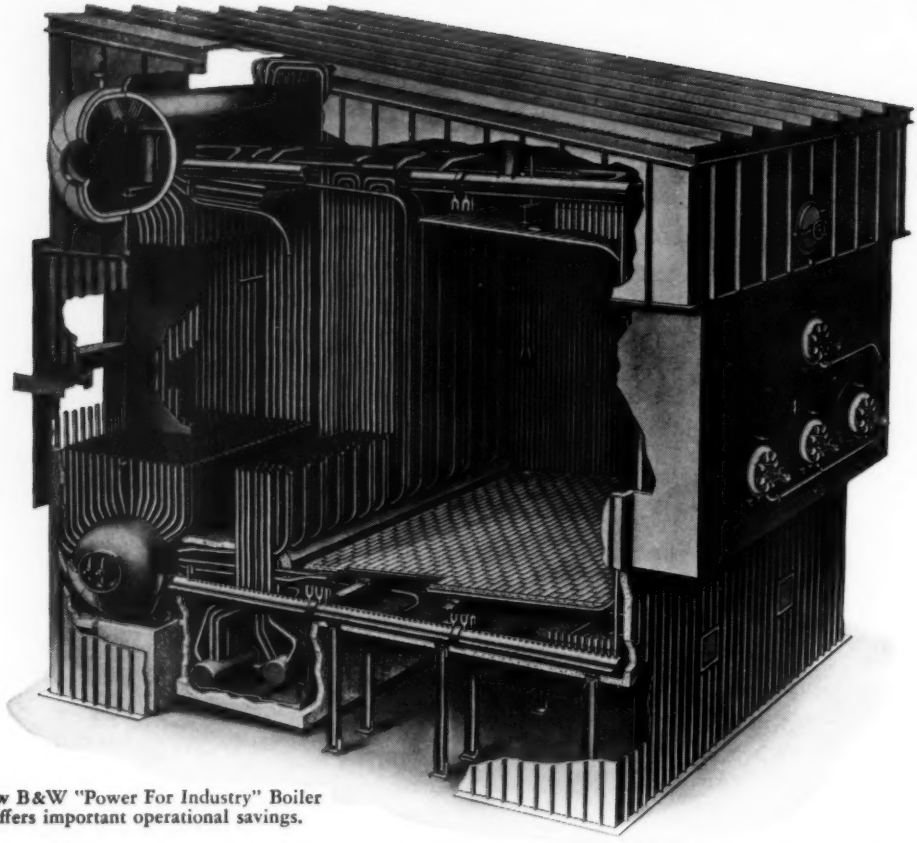
PHOTOGRAPHY AND THE SEARCH FOR KNOWLEDGE — PAGE THREE

Vol. 11 NOVEMBER, 1958 No. 6



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CONTENTS

COVER STORY

Looking like a giant umbrella in this air view is the Union Dome, largest circular building in the world, located at Baton Rouge, La. Big enough to enclose a football field or major league baseball diamond, the Union Dome has a diameter of 384 feet across its base and rises to a height of 120 feet—as high as a 10-story office building. The Dome is the first major industrial application of the geodesic principle of design and houses regional tank car repair and maintenance facilities of Union Tank Car Company of Chicago. The Dome is made of 321 six-sided steel panels welded together and strengthened by a network of rods and pipes.

Evening of

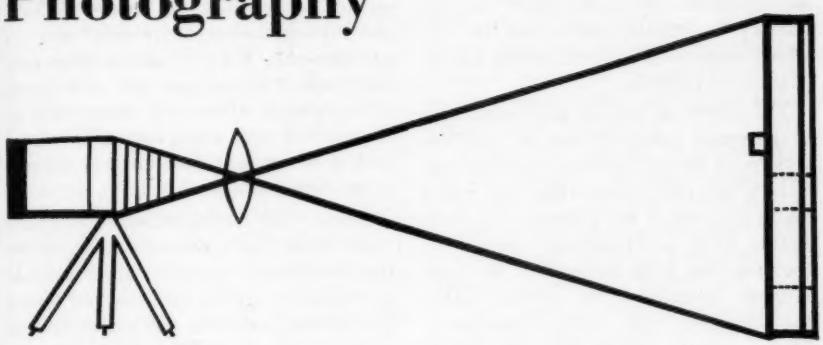
January 22, 1959

Around the World in 90 Days

- **Bob Bacon's Pictures**
- **Street Bazaar**
- **Fine Dinner**

Details later

Photography



and the Search for Knowledge

A speech by Donald McMaster, vice-president and general manager of Eastman Kodak Company, before the Society of Photographic Scientists & Engineers on Oct. 9, 1958, in Rochester, N.Y.

There is both pathos and grandeur in man's eternal search for knowledge. He has moments of bewilderment and errant convictions and childlike despair. But he also has his times of triumph when intensive work, insight, and inspiration bring him, suddenly, to new understandings of his world and of himself.

His progress is the product of his curiosity—of the endless effort to satisfy his curiosity. He abhors uncertainty — he wants answers — he must know. This driving urge to know has led him to devise remarkable means for expanding and for disseminating his knowledge.

Would he measure the passage of time and know the time of day? The sun dial and the hour glass served for a while until the pendulum was invented and he had fashioned a mechanical clock. Did he aspire to know the stars? He reinforced his eyesight, first with the simple telescope of Galileo, and later with the giant eye of Palomar. Would he know where he is upon the trackless sea? The magnetic compass and sextant first gave him the answer. Today, the pilot house is a maze of electronic instrumentation.

Thus, man has refined—and refined again—the instruments and the methods used to expose the secrets of the earth and of the universe.

But you will recognize that, throughout the history of civilization, there were certain barriers to learning—to knowing —which constantly frustrated man in his search for knowledge. These were barriers which his *natural* powers of observation simply could not penetrate.

How, for example, was he to study phenomena too rapid for the eye to follow? How study the interior of the living body? How penetrate the cosmic dust which hid half the heavens from his view? How detect and classify the rays that reached him from outer space? For a long while, he did not know that there was momentous information hidden within an invisible spectrum. It is clear that his vision was seriously limited until, by his own genius, he devised an artificial eye which he called photography.

Advent of Photography

It was thus that whole new areas of information were opened to him—and the search for knowledge was vastly accelerated. Yet, all that has been accomplished up until now seems almost insignificant when we contemplate the immediate future and, in particular, the potential results of combining the photographic and electronic sciences into a single tool.

It isn't easy to gain a clear perspective of all the events that have led to the point where we now stand. So much of the history of our discipline appears to be the result of chance and haphazard progress. Certainly, the ancients who, long before Aristotle, discovered the sensitivity of silver compounds to light had no conception of its significance. The German scientist, Schultze, may have been dimly aware of the possibilities when he experimented in a scientific way with the sensitivity of silver compounds, but Thomas Wedgewood, nearly a century later, was merely looking for a short-cut to silhouette making. Rontgen discovered the x-rays while studying the discharge of electricity.

Thus, as you well know, the art and the science of photography developed, to a large extent, on an empirical basis. But the inherent possibilities drew dedicated researchers. Perhaps we can credit the work of Fox Talbot, started in 1835 —he discovered the development process in 1841—with establishing the scientific foundations on which photography has since been built.

I think the work of those gifted men who have developed and made use of photography is best appreciated when we consider how wonderfully their work has helped to reduce those barriers to learning of which I spoke. Because I am thinking of the traditions in which you work, perhaps we can review with interest and pleasure some outstanding achievements in the field. Inevitably, we shall also take account of advances in the field of optics as well as of chemistry because the achievements of photography are to a degree the achievements of the optical scientist.

"Control" of Time

It is interesting to speculate on which particular development or present day use of photography would most have amazed those who lived a century ago. A good case can be made for the ability of photography both to compress and to extend time. Time is hardly a thing to be tinkered with—or, at least, I'm sure it was once considered so. After all, the seconds and minutes and hours of the day are merely the fractional parts of an unvarying rhythm—the precise ticks which beat out the ponderous turning of the earth. You might say there is an inevitability about time that leaves little scope for applying the ingenuity of man. Yet, the irreverant photographer has stepped in and worked his magic in a way that would surely have amazed earlier generations. But to us, wise as we are with hindsight, the truly astonishing feature is the versatility with which this tool is used to learn and to teach. An interesting example of several years ago remains fresh in my mind. The railroads were faced with a baffling problem. It was known that the drive

wheels of steam locomotives traveling at high speed would leave the rails at some point in the piston cycle. But at what point — and why — and to what height the wheels jumped, no one could determine. The photographer was appealed to, and his high-speed camera gave all the answers. From the layman's point of view, it was an eerie movie—the great drive wheels slowly turning and rising leisurely from the rails at each revolution. I must confess that at least one viewer found it difficult to adjust himself to the realities of the situation.

And suppose an audience of one hundred years ago could have watched the hummingbird poised on wings which beat so deliberately that the action of every feather could be studied with ease. Here was clear evidence, certainly, that they should not believe their eyes.

Utilitarian Value

Well, this is spectacular business—but you and I are aware of its utilitarian value — of the countless uses made of high-speed photography to expand knowledge in the research laboratory, on the production line, and in the wind tunnel. One might fairly say that the photographer has made sport of supposedly invariable time — but he has added vastly to the sum of useful knowledge in the process.

The ability of certain nonvisible rays to penetrate solid substances, and the actions of those rays on sensitized materials, are phenomena that you and I take pretty much for granted. Yet, here again, what a formidable barrier to learning has been diminished by your science. Nowadays, the doctor makes his diagnosis with greater assurance. These shadow graphs help the manufacturer to determine if a casting is free of faults—or if a weld is sound. The added safety factor in the construction of air frames is a prime example of the valuable knowledge which only x-ray photography can provide.

In all that I have been saying, you will find the suggestion that photography—as with any other tool—is not an end in itself. It is a means of gaining information that can usually be gained in no other way. What kind of information will your efforts lead to in the years ahead?

All of us have at least a partial answer to this question. We can all foresee the expansion of present uses of photography. We can also predict new and refined techniques and new kinds of equipment which will surely add to the value of your work. Let's take a brief look at the present situation and at some of the future prospects.

Some of the technical papers you have read before this conference demonstrate the considerable progress already made in designing special cameras and lenses for tracking satellites and missiles. This work is suggestive of the contributions you will make in bringing back information from outer space.

What challenges do you face in the coming era of space technology? For the time being, we recognize that you are largely preoccupied with military considerations. These, undoubtedly, will remain your paramount concern for the duration of our current state of national peril. But, looked at long range, the study of space will surely occupy your attention to an increasing degree—simply because space is there and man's insatiable curiosity will drive him to ex-

It takes a heap of chemicals to turn a piece of wood into a lead pencil, reports *"Chemical Week."* To produce ten million gross of pencils this year, manufacturers will need 565,000 gallons of lacquers, 370,000 pounds of dyes, 130,000 pounds of synthetic gums, 50,000 pounds of antimony, 30,000 pounds of a lead compound, 30,000 pounds of glycerine, 25,000 pounds of sulfur and 20,000 pounds of lime.

plore it—much in the way he is driven to climb the highest peaks.

Into Outer Space

We may be sure that much of the information about outer space will be obtained by photography. Just as the camera has been the astronomer's indispensable tool, so it will probably be the primary tool of the space scientist. Photography's role in this field can be readily foreseen.

Take man's first exploration of the moon, for example. We may safely predict that rockets in orbit around the moon will be the first successful instruments for relatively closeup study of the moon's surface — including the moon face which remains forever hidden from direct earthly view.

How are these orbiting rockets to give us the information they are sent to gather? Television has been suggested, but even with the great increase in the strength of its signals which has recently been achieved, there seems no likelihood that we could ever directly produce a sharply detailed television image because of the high resolution required.

Photography, however, practically guarantees a satisfactory solution. Your imaginations will hardly be strained if you conjure up a rocket carrying automatic cameras with telephoto lenses and automatic processing equipment. Add the TV system needed to scan the finished film minutely and transmit the image back to earth and you have a capable instrument for doing the job. This possibility, I dare say, strikes you as much less fanciful than did the idea of sending photographs by wire or wireless when this was first proposed a relatively few years ago. True, we don't yet know what difficulties may be caused by cosmic rays or other radiation. But we're finding out something about that. At this very moment, somewhere in outer space, *Explorer IV* is dutifully sending back impulses which add to our knowledge of these matters.

When man himself eventually goes out into space, it's a dead certainty that he'll take his cameras with him. Of course, he may need some special optics —some newly designed equipment—incidental problems, I should say, which you will have to solve for him. And, of course, one speculates on the life expectancy of the first space travelers and their equipment.

Spectra of Mars

In connection with all this, you are probably aware of current plans to study the spectra of Mars from a high-flying balloon. From 100,000 feet above the earth, it is hoped that much can be learned about the atmosphere of Mars and especially about its water content. Surely, these efforts foretell the day when men will visit this provocative neighbor of ours. For just as surely as this indomitable creature has moved out of the cave to his present estate, he will set foot on other worlds. You and I may not live to see his triumph, but we'd better get busy with our preliminary assignments all the same. Keep in mind all the celestial reconnoitering by photography which must be done in advance.

One of the most interesting subjects of astronomical research is, of course, the sun—and here again photography is the basic tool of learning. Man's interest in the sun is natural enough—even the ancients recognized it as the source of all life. Early religions, including those of the first American civilizations, centered around worship of this nearby star.

The Deceptive Sun

Until photography and electronics started unlocking its secrets, the sun appeared to be a fairly stable performer. We have long since learned that this appearance is a deceptive one. By continually photographing its surface, astronomers have learned much about the violent activity of this atomic furnace. As many of you know, a number of observatories around the world keep a continuous photographic record of the sun's activities. The information they gather has great practical value. Already, long-range weather forecasting based on the study of sun spots is beginning to show dependable results.

It has been said that photographic plates are a basic tool of the nuclear physicist. And this is true. The nuclear physicist has been largely dependent on sensitized materials for his information. What happens in a Wilson cloud chamber or in a bubble chamber can be recorded for study only by photography. The charged particles which whirl

around at fantastic speeds in the so-called atom smashers strike photographic emulsions and leave their characteristic tracks for later study. Our knowledge of cosmic rays has come largely from photographic evidence. The study of cosmic rays, incidentally, has presented the film maker with a unique problem. To record the track of these penetrating rays, an unusually thick emulsion is required—so thick, in fact, it could not be satisfactorily processed as a single layer. The answer has been to prepare emulsion in layers—layers, of course, with no film support. In turn, after exposure as a block, these layers are separated for developing and then reassembled in a precise way so they are in perfect register for study.

Perhaps no other development of recent years has called attention to photography's untapped potential as have the electronic computing systems. All the functions of photography—the recording of information—the storage of information—the retrieval of information—are here brought into play in a way to stagger the imagination. It is reassuring to see what has already been done in adapting and refining photographic techniques to these new purposes.

In Electronic Computers

For example, as of today, the output of electronic computers can be recorded by photography at the rate of 100,000 characters a second. We foresee a rate of 1,000,000 characters a second in the near future. In fact, photography can record faster than the computer can compute. Because it can, photography has made it possible to use the highly expensive computer at full efficiency. The small amount of energy required for photographic recording renders this method faster than the electrostatic and magno-photographic methods of recording.

Photography can also provide the "memory"—the built-in information—on which the computer feeds. At the present time, a computer is being programmed to translate Russian into English. The information it must have to do this is provided on a 12-inch disc where 60 million discrete bits of information have been transcribed by photography. And, it should be added, only part of the surface of the disc is used.

Today, computers are being used to analyze vast quantities of information and to sort out or extract the new or wanted material. It is an actual fact that, by this method, a thousand papers on a given subject can be scanned—the repetitive sections eliminated—and a condensation of the information produced on a photographic film. I should think that any one of you may expect your researches to be advanced by such electronic scanning of information from voluminous sources. Certainly, the scientist will avoid getting bogged down by too much or by disorderly information once he puts the computer to work gathering his information for him.

As the electronic computers build up vast stores of new information, the problem of storage and retrieval will grow increasingly acute. But photography appears to be fully equal to these problems. You are all aware of various systems for reproducing and storing information by photomicroscopic means. Not only can incredible amounts of material be condensed into a tiny space, but effective methods have been devised for obtaining quickly any specific information from the file. But efficient as these photographic methods of storing and retrieving information already are, great advances are undoubtedly on the way. Today, we store information photographically in two dimensions. Perhaps, in the future, we shall add the third dimension—depth—just as we already have in the study of nuclear events. Add color, and we can increase the storage capacity of film by several orders.

Storage of Information

The use of photographic methods for retrieving stored information is growing quite common. But the benefits of these systems have scarcely been realized as yet. We can, however, safely forecast some of the possibilities. Consider, for example, the storing of all known medical information in a single place. The physician, faced with a rare disease, could telephone to this center and, within a matter of minutes, have the precise and most useful information needed out of all medical history for making his diagnosis. This is just one example of what we can foresee.

The use of photography in storing and bringing information to men clearly has incalculable value. So important is this technique that it will certainly speed remarkable new developments in the science of photography. I think we can look for photographic materials capable of being processed with great simplicity. Perhaps the younger or the next generation of photographic scientists will devise methods for reading the latent image—rendering development wholly unnecessary for some purposes. Think how this would speed computer operation—one can imagine a computer being fed with information contained in latent images and its computations being made instantly available through latent images.

If a good night's sleep is worth a million dollars, then perhaps a new electronic gadget at $125 is a bargain, says *"Product Engineering."* The gadget reproduces the sound of falling rain and is said to stimulate the primitive instinct to sleep with the hypnotic sound of rainfall.

By what means the latent image is to be read, probably no one yet knows, but it is possible that the answer will be found in time.

Perhaps some of you have already made use of computers in designing lenses. Nowhere have the capabilities of the computer been more dramatically displayed than here. The arduous and interminable calculations once carried out on manual calculators can now be completed in a matter of seconds.

What is to Come?

When we review all the remarkable achievements in your field, we inevitably wonder what is yet to come. The rapid advance in photographic technology which we have witnessed in recent years suggests rather startling developments in the future. Think of the entirely new concepts which have invaded the field in recent years. The Land Polaroid camera, for example—who could have foreseen the rather brash way in which this hand-held instrument dispensed with the darkroom? Yet, more amazing things are in prospect. Before too long, the diffusion transfer system or similar systems may be producing prints in full color about as readily as in black and white.

When my own company came out not so long ago with a new copying method known as Verifax, it was considered quite notable that development of the paper was carried out with a single solution. And indeed this was quite revolutionary. We have every reason to believe that even more startling advances will be made.

Of particular interest to many of you must be the great advances in the resolving power of films. There are films available to you at the present time which can clearly resolve 2,000 lines to the millimeter at low sensitivity levels—a capacity which actually exceeds that of present-day optics. As better lenses are designed, the value of these films can better be utilized.

Again, the speed of sensitized materials has been, and is being, multiplied over and over again. Films with an equivalent exposure index of 6400 and greater are being produced — films, I might add, with stable characteristics. It wasn't so long ago that an equivalent exposure rating of 200 was considered exceptional. Furthermore, a greater variety of film characteristics tailored to specific uses is now available to the scientist and the technician. Advances in emulsions for spectroanalysis are good examples of this.

Simpler and faster methods of processing come in for a great deal of research. It shouldn't be long before films can be viewed almost instantly after exposure. We may expect that color processing will be greatly simplified and color prints will be less costly for the customer.

It would take a rash man to predict the developments another ten years will bring. We know that the usefulness of photography will be vastly expanded. We can be certain that our present efforts — our present programs — will lead us into new paths and that we shall be gathering information by photography and pursuing goals not even dreamed of now.

Social Significance

In view of photography's immeasurable usefulness to society, we can see that every forward step of the photographic scientist and engineer has great social significance. Increasingly, the expansion of man's knowledge will depend on your work. Increasingly, education and communications will be advanced by your work. The health and welfare of men falls to your care in ever greater degree. And it may well be that it is your destiny to open up whole new areas of knowledge never before revealed in the whole history of mankind. Matters now susceptible to nothing more than vaguest speculation may tomorrow be revealed in clear and incontrovertible terms by photography. To repeat myself, you may soon be gathering information which is beyond all present comprehension.

In his recent book, *Of Stars and Men*, Harlow Shapley writes,

"For the sake of simplicity, we are tempted to put all the world of physics and perhaps all the biological world into the framework of four properties — Space, Time, Matter, and Energy. . . . Although not yet recognized or isolated, may there not be other entities, perhaps some

of even superior importance? In particular, is there any property of the material world that is essential to making the universe go?"

And later Shapley writes,

"We seem to belabor this point but the somewhat mystical fifth entity must be referred to. . . ."

Now here indeed is a mystery. But note that it is of an order that was once solely within the province of the mystic —the oracle. Later, the philosophers—Zeno, Plato, Locke, and their kind—turned a speculative eye on these matters. These were the so-called "metaphysical philosophers who delved into questions of being and essence."

Their brothers, the "natural" philosophers — such as Archimedes and Newton — appear to have remained largely aloof from these fields of inquiry — keeping their attention focused of the verifiable phenomena. Indeed, it would appear that for centuries the dividing line between the metaphysical and the scientific areas of inquiry was precisely here. On one side were the nonverifiable phenomena—on the other, the verifiable.

Fields Now Merging?

But I think we must ask ourselves if these two fields of inquiry are not now merging. Just as the metaphysical philosopher invaded the field of the mystic, so the natural philosopher—the scientist —appears to be moving in on the metaphysician. The mysteries which Shapley speaks of are, I assert, a direct challenge to you. After thousands of years, if I may so express it, the time has come for you to usurp the realm of the Delphian Oracle.

I say this because man's driving urge to know must carry him far beyond where he stands today. More barriers to knowing will give way to his persistent probing. The work you are doing is a prime part of the intellectual and scientific effort to solve the riddles of the universe. In your hands, photography will bring new understandings. Certainly, we have not yet found the limits of photography's broad capabilities as a revealer of knowledge. The opportunities are just as broad as they were in Talbot's day. I know you will seize those opportunities for the benefit of all men.

Speeding was blamed for 13,200 deaths on U.S. highways in 1957.

In 1957, 7,500 pedestrians were killed by autos in the U.S.

F.S. Friel Predicts Problems of Space

The president of the American Society of Civil Engineers said in New York on Oct. 15 that the civil engineer may "some day soon be required to work on problems of construction where the law of gravity does not exist."

Francis S. Friel, of Philadelphia, in taking office as the 1959 president of the society at its annual convention warned, however, that "before we engage in that activity we must be sure that we are ready for such advances."

Friel, a prominent consulting engineer who, among many other projects was the design engineer for the Aberdeen Proving Grounds in Maryland, warned his colleagues at the Hotel Statler-Hilton:

"We are now sending powerful missiles into space. Should we not learn to make them truly guided missiles?

"We must know where we are going and why—to know how is not enough!"

In a speech marked by his references to the responsibilities of the engineer, Mr. Friel said that the civil engineer today must consider effects other than those of simple physical stress and strain on his materials.

"It is no longer enough to know how to construct a dam which will hold water, and let it go at that. We must also learn to think of the social and political implications of all our works."

The new president of the 41,000-member society said that there are many problems ahead for the engineering profession.

"Traffic, even as we improve and increase our means of transportation and as our cities grow, becomes a menace which threatens to choke the life out of our great urban centers," he declared.

"The answer may lie in multi-level streets and highways, or in improved public transportation. Whatever the answer, it is up to us as civil engineers to find it.

"Our water supply in this country, and in many other countries whose fate we ultimately share, is seriously depleted and in some regions has been tragically wasted.

"Also, flood control remains a great unfinished project which must be completed. For all this work, we have the knowledge and the means."

Mr. Friel is head of the consulting firm of Albright & Friel, 3 Penn Center Plaza, Philadelphia. He succeeds Louis R. Howson,MWSE, of Chicago, as president of the civil engineering group.

Good Lighting

A half-million dollar street lighting system featuring a central F-M radio transmitter unit and 70 receiver units, one each in the base of 70 fluorescent light poles, is now brightening State

street in Chicago, reports *Electronics*. This is thus the first major lighting system to utilize radio for control. Each pole's receiving set will perform automatically the following functions: turn on all lights at dusk, turn off portion of lights at midnight and turn off all lights at dawn.

Construction on Permafrost Studied

Construction problems on land that remains frozen throughout the year, a characteristic that is found in about one-fifth of the land area of the world, occupied the attention of engineers attending the annual convention of the American Society of Civil Engineers in New York on Oct. 15.

Stating that such a construction project is like "trying to build a house on a block of ice," J. A. Pihlainen, of Ottawa, Canada, reported that construction in permafrost, the name given to frozen areas, has been successfully worked out by the adoption of unusual engineering techniques.

The speaker, of the National Research Council, Division of Building Research, Ottawa, said that almost one-half of the U.S.S.R., much of Alaska and more than one-third of Canada are underlain by permafrost.

Depending on the location, this condition varies from five feet in thickness to approximately 1,300 feet thick.

Mr. Pihlainen said that the presence of perennially frozen soil at a short distance below the ground surface presents unique difficulties to construction. The principal properties of permafrost which give rise to these difficulties are its ice content, its thermal sensitivity and its imperviousness to water.

The ice in a frozen soil acts like a cement, bonding the individual soil particles. The result is a material with considerable, often rock-like, strength. The volume of ice in permafrost may be as much as six times that of the soil solids. Thus, thawing of this ice can change frozen soil from a firm bearing material to a soft, liquid-like slurry with no supporting power.

The thermal sensitivity of permafrost, he said, makes it a difficult material in which to carry out construction without causing some thawing of the frozen soil. This is because permafrost conditions at an undisturbed site are in such a delicate state of thermal equilibrium, fluctuating with variations of climate and with the existing type of vegetation.

That permafrost is impervious to water is shown by the fact that rainfall and water from melting snow cannot drain into the ground because of permafrost, and tend instead to form stagnant pools and lakes. This complicates construction operations and imposes additional problems on the design of buildings in permafrost areas.

The problem has been solved by a pile construction method for foundations, Mr. Pihlainen stated. Present practice is to thaw, or drill, holes at the pile locations, to drive or place the piles, and then allow the piles to freeze in position.

It is necessary, he said, to minimize heat losses to the ground or to preserve permafrost conditions as much as possible. This preservation of permafrost conditions is assisted by keeping the disturbance of the natural vegetative cover of the ground to a minimum. Also, by a provision of an air space between the floor of the building and the ground surface through which cold air may circulate during the heating season. Furthermore, it is essential to provide ground insulation in the form of additional moss or dry organic material under the building.

Consequently, basements are impossible for buildings in permafrost areas, because the heat loss from the basement would cause further thaw and the building to sink.

January Meeting

The 65th Annual Meeting of the American Society of Heating and Air-Conditioning Engineers and the 14th International Heating and Air-Conditioning Exposition under the auspices of ASHAE will be held in Philadelphia, Pa., January 26-29, 1959. ASHAE registration headquarters will be at the Bellevue-Stratford Hotel. The Exposition will be held in Convention Hall. Prior to the opening of the 65th Annual Meeting and the Exposition on Monday, January 26 the Council and various committees will hold meetings on Saturday and Sunday, January 24 and 25, 1959.

The Annual Meeting will consist of seven Sessions including three Symposiums and one Topical Session. The Topical Session will consist of papers concerned with Human Comfort as related to indoor environment. One of the Symposiums will be on the general subject of Hydronics, the other one on Heat-Pump Performance and the third Symposium will be on Corrosion and Water Treatment. The various papers planned for the 65th Annual Meeting have been selected for their timely interest.

Tournament Held at Inverness

Beautiful Inverness Golf Club in Palatine, Illinois was the scene of the eighth Annual WSE Golf Tournament under sponsorship of Western Society of Engineers. Inverness Golf Club was obtained for use by Western Society through the good graces of Bob Price of Ingersoll-Rand. Mr. Price is Chairman of Western Society's 1958 Young Engineers Forum. The Tournament itself, held September 11, 1958, was under the able direction of Chairman of the Special Events Committee LeRoy Cather, Vice President of DeLeuw Cather & Co.

Its great success was due to a combination of factors . . . a beautifully clear day ideally suited for golf . . . greens which rank with the best in the area . . . a club whose decor is informal enough to be comfortable, yet still in distinctively good taste . . . and by far most important—the glowing spirit of conviviality and good fellowship of all those attending.

There were prizes for most everyone. Low Gross First Prize went to R. Bogan, Jr., Second Prize went to B. Stark, and Third Prize went to Robert Bacon, Jr. Other golf prizes went to: Bob Campbell, WSE Member C. A. Walls, WSE Member Bob Price, R. J. Gunderson, WSE Member W. W. Wallace, C. Sivertson, T. Krosell, W. Cotter, C. W. Nicol, J. Beall, Jack Draney, J. D. Bader, WSE Member L. A. DeSautels, and WSE Member N. Turcot.

These prizes, together with door prizes, were presented at a sumptuous banquet at the Club. The Grand Door Prize was a deluxe equipped picnic kit case which opened into a table containing a service for outdoor eating. It went to WSE Member Charles Shupe.

On hand for the festivities were: WSE President W. R. Marston, Past Presidents A. P. Boysen and G. L. Jackson, George DeMent, Commissioner of Public Works for the City of Chicago, and the wives and guests of many WSE members. Among the organizations represented at the Golf Tournament were: Portland Cement Association, DeLeuw Cather & Co., Duff & Phelps, American Bridge Division of U. S. Steel, Ingersoll-Rand, Western Precipitation Corp., P. F. Griffenhagen, Sargent & Lundy, and various bureaus of the city of Chicago.

President Marston echoed the sentiments of all those WSE members, their wives, and guests who attended the 1958 WSE Golf Tournament when he pointed out that the great success of the 1958 WSE Golf Tournament gives promise of an even bigger and better one in 1959—so start lining up your foursomes now!

Nuclear Shipment Arrives for Dresden

The first shipment of nuclear fuel for Commonwealth Edison's Dresden Nuclear Power Station arrived at the plant site eight miles east of Morris, Ill. on Nov. 4.

The shipment, valued at approximately $1,700,000 was made by General Electric Company, builder of the plant, from its nuclear fuel fabricating facility at San Jose, California.

A single truck made the delivery in a three-day trip from the West Coast. The shipment consisted of 54 fuel bundles of enriched uranium pellets clad in zirconium tubing.

A single truckload of nuclear fuel is expected to produce as much electricity as 200,000 tons of coal or more than 3,000 rail carloads.

The 54 bundles are the first of 488 which will be required for the full initial fueling of the Dresden reactor. The value of the full loading will be approximately $15,400,000 and will produce about as much electricity as 1,800,000 tons of coal.

The nuclear fuel in its present form is harmless. There is no danger in handling it, as it does not become radioactive until after it is "triggered" inside the reactor core.

The first and subsequent shipments of the fuel will be stored at Dresden until the reactor is ready for loading.

The 180,000-kilowatt Dresden plant, which is scheduled for operation in 1960, is being built by General Electric for a contract price of $45,000,000. Commonwealth Edison, which will own and operate the plant, is paying $30,000,000 of the contract price of $45,000,000, plus site and overhead costs.

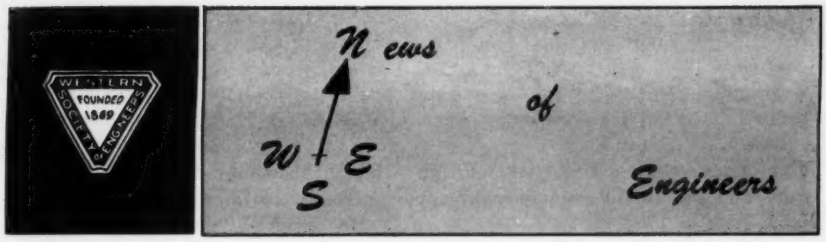
Associated in the project with Commonwealth in paying $15,000,000 of the cost as a research and development expense are American Electric Power Company, Bechtel Corporation, Central Illinois Light Company, Illinois Power Company, Kansas City Power & Light Company, Pacific Gas and Electric Company and Union Electric Company.

Dresden will be the first full-scale, privately-financed atomic power plant to come into operation in the United States. Its nuclear power reactor is the largest under construction in the country.

Bright Panorama

A brilliant industrial panorama was created for the 23rd National Exposition of Power and Mechanical Engineering, held at the New York Coliseum December 1 to 5. Forecasting the business expansion predicted for 1959, it portrayed the methods and mechanisms whereby the manufacturing industries will be able to increase productivity with economic advantage.

The Exposition was held under the auspices of The American Society of Mechanical Engineers in conjunction with its 1958 Annual Meeting.



Josam Manufacturing Company announces the appointment of J. S. Newman as executive vice-president and general manager of Josam Manufacturing Company, its subsidiaries and affiliates.

Mr. Newman is a member of many American Trade Associations, among them the American Society of Sanitary Engineering, the Producers' Council, American Foundrymen's Association, and attended the Schools of Engineering at Purdue and Ohio State Universities.

Josam takes particular pride in this announcement, as Mr. Newman will be occupying the position formerly held by his father, Josam past President, Mr. Leo M. Newman.

* * *

Theodore W. Van Zelst, MWSE, has been named one of the Ten Outstanding Young Men in the Chicago area by the Chicago Junior Chamber of Commerce. The ten young men were selected for their contributions to their professions and the general welfare of the people.

Mr. Van Zelst is president of Soiltest, Inc., manufacturer of engineering test apparatus for soils, concrete and asphalt. Soiltest, Inc. is the largest company of its kind in the world. Testing equipment manufactured by Soiltest is used by over 4000 laboratories in 105 countries.

Van Zelst is the publisher of *The Testing World,* an engineering newsletter with an international circulation of 75,000 copies.

Mr. Van Zelst is also known for his extensive lectures abroad.

* * *

Thomas M. Dahl, 18-year veteran in the engineering and construction field, has been appointed midwest region new business representative of United Engineers & Constructors Inc., Philadelphia.

Formerly a supervising engineer at the firm's Philadelphia headquarters, Dahl in his new post will have offices in Chicago.

He will share new business responsibilities with and report to J. N. Rolston, midwestern region vice-president for the states of Ohio, Kentucky, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, and Missouri.

Dahl joined United Engineers in 1946 and held posts of supervising designer, electrical engineer and supervising engineer. He has had extensive experience in steel mill and power plant engineering and construction.

Dahl is a registered Professional Engineer in five states and a member of the American Institute of Electrical Engineers.

A native of New York, he attended Drexel Institute of Technology, Philadelphia, and Stevens Institute of Technology, Hoboken, N. J.

* * *

Ronald M. Monson, Naperville, Ill., has joined the staff of the Argonne National Laboratory as a senior plant engineer in the Plant Engineering Department.

Monson previously served as a plant engineer at Argonne from 1949 to 1957. He returns to the Laboratory after a year in a similar capacity with Froedtert Enterprises.

His other professional experience includes assignments as a structural designer with Ragnar Benson, a construction engineer with United Air Lines, and as an engineer with Tennessee Copper Co. and Giffels and Vallet. He served in the U. S. Navy during World War II.

Monson attended Austin High School, Chicago, and Illinois Institute of Technology, where he received his bachelor of science degree.

The Argonne National Laboratory is one of the nation's key centers for research and development of peaceful uses of atomic energy. It is operated by the University of Chicago under contract to the U. S. Atomic Energy Commission. It is located 25 miles southwest of Chicago, near Lemont, Ill.

* * *


M. C. Sielski

Matthew C. Sielski, MWSE, director of the Chicago Motor Club's safety and traffic engineering department, on Nov. 12 was elected president of the Institute of Traffic Engineers. Other officers named at the institute's 28th annual meeting in Miami Beach included Edward G. Wetzel, New York, and Alger Malo, Detroit, vice presidents.

Sielski joined the Motor Club in 1939 as a traffic engineer, was promoted to his present position in 1942, and has had a prominent part in safety and traffic improvements in Chicago, Cook County, downstate Illinois, in Indiana, and elsewhere in the nation.

Born in Winnipeg, Sielski came to Chicago with his parents as a child. After graduation from Schurz high school and the University of Michigan, he approached the old Chicago Surface Lines for a job as traffic engineer. He

was told they would be glad to have him on the staff but would be unable to pay him a salary. "It's all right with me," he said. So for six months he worked without pay until the Motor Club picked him for its staff—with pay.

Sielski lives with his wife, Mickey, at 330 Rollwind Drive, Chicago. They have three children — Bonnie, a student at William Woods college, Fulton, Mo.; Robert, who attends Niles Township high school; and Betty who goes to the Golf school. He is a member of the Glenview Traffic Commission and a former member of the Glenview Community Church executive board.

A factor in the development of behind-the-wheel driver education, which the Motor Club sponsors in its territory, he is an authority on school crossing protection and has written several articles on the subject for engineering magazines.

His professional affiliations, in addition to the Western Society, include traffic conference executive committee, National Safety Council; director, Illinois Highway Users Conference; Highway Research Board; and highway and safety committee of the American Automobile Association.

* * *

The appointment of Thomas J. McNeil as vice-president of Soiltest, Inc., of Chicago, has been announced by **Theodore W. Van Zelst,** MWSE president.

McNeil, formerly eastern manager and public relations director of the corporation, will continue public relations activities for Soiltest, Inc., from the company's New York office at 60 East 42nd Street.

The announcement was made on McNeil's return from a tour of Mexico and Central America during which time he gave a paper on engineering testing at the Third World Congress of the International Road Federation in Mexico City.

* * *

A visiting associate professor and three assistant professors were added to the faculty at Illinois Institute of Technology, Chicago, effective Sept. 1.

They are: Dr. Louis A. Kokoris, visiting associate professor of mathematics; John W. Emerson, assistant professor, Institute of Design; Dr. Sidney A. Guralnick, assistant professor, civil engineering, and Dr. Isadore Hauser, assistant professor, physics.

Kokoris, an assistant professor at Washington University, was a visiting lecturer at Yale University last year. He also has taught at the University of Washington and the University of Chicago, and was an IIT evening instructor from 1948 to 1951.

An authority on power - associative algebras, he has attended Wright Jr. College, the University of Wisconsin, and received his bachelor's, master's, and Ph.D. degrees from the University of Chicago.

Emerson heads the art education division of the Institute of Design. He came to IIT from Chicago Teachers College, where he had been chairman of the art department since 1953. He also has been art consultant and lecturer at St. Joseph's College.

A graduate of the Art Institute of Chicago, he has done academic work at DePaul University and the University of Chicago. He received his master's degree in art education from the Art Institute of Chicago, and has done advanced work at the Institute of Design.

Guralnick, formerly an assistant professor at Cornell University, has made studies of deflections, shear strength, and lateral stability of reinforced concrete beams and slabs as well as light-gage structural steel sections.

Consultant to the Fenestra Corp., Buffalo, N. Y., Flexangle Corp., West Hartford, Conn., and Principe - Dana Corp., Long Island City, N. Y., he has been an engineer for the T. H. McKaig Co., Buffalo, N. Y., and the Atlantic Refining Co., Philadelphia.

A graduate of the Drexel Institute of Technology, he received his master's and Ph.D. degrees from Cornell University, where he was awarded the McGraw Fellowship in civil engineering.

Hauser was formerly an associate professor at Northern Illinois University. Prior to 1956 he taught at South Dakota School of Mines and the State University of Iowa.

He received his bachelor's degree from Brooklyn College and his Ph.D. degree from the State University of Iowa. His research includes a study of directional correlations of Beta-rays.

* * *

Bodine Electric Co. has announced the moving of their General Offices to their new building at 2500 W. Bradley Place, Chicago 18. The new million dollar, two-story office building has a floor space of 47,428 square feet. It is completely air-conditioned, and has a modern cafeteria and a lunch room capable of seating 350 people.

Bodine's new office building is located directly in front of their two year old, 200 ft. x 640 ft., one-story factory building. Including basement area, the factory has a floor space of 148,500 square feet.

Located on a 24 acre tract of land in the Mid-City Industrial Center, Bodine's office and factory facilities can be greatly expanded in the future. As the Center's name implies, it is situated close to the Chicago business district.

Plastic Launchers

The U.S. Navy is using fiberglass-reinforced plastics for torpedo launchers and torpedo tubes, reports *Product Engineering*. Corrosion resistance, high strength and simplified fabrication are the reasons for turning to the new material.

Reviews of Technical Books

Philosophy of Structures

Philosophy of Structures by Eduardo Torroja. English version by J. J. Polivka and Milos Polivka, University of California Press. First edition, 1958. Pages, 366. Price, $15.75.

Eduardo Torroja is one of the great engineers and architects of our time. His revolutionary structural achievements in his native Spain, as well as his consulting services on famous structures throughout Europe, have placed him in the same class as Maillart, Freyssinet, LeCorbusier, and Wright.

This volume has already appeared in Spain under the title *Reason and Use of Structural Types*. The English translation also includes American examples of modern structures. The author points out that technical literature on structural engineering abounds with theoretical works of a mathematical nature, but few publications are concerned with the various kinds of structures or the fundamental reasons for their existence.

The purpose of the book is to offer an informal discussion that will stress ideas and concepts at the expense of anything mathematical or theoretical. More than 200 illustrations supplement the author's presentation of the evolution of basic structure types from the Roman arch to the hyperboloids. One chapter is devoted to the "designer and the organization" in which the author discusses the desirable qualities of the designer and his relationship to the professional world and the society as a whole.

Heat Transfer

Heat Transfer, Volume II by Max Jakob, John Wiley & Sons, New York 16, N. Y. First edition, 1957. 652 pages. Price, $15.00

This volume by the late Max Jakob completes his excellent work on heat transfer which began with the publication of Volume I in 1949. The two volumes constitute the most complete collection of detailed analysis and derivations, together with applications, that is available today in the field of heat transfer.

Volume I contained a section on basic equations covering all three branches of heat transfer; and detailed sections on conduction and convection.

Volume II continues with the detailed section on radiation, offering a comprehensive analysis and discussion of radiant transfer for spaces of simple configuration, and concludes with a section on application. The latter discusses the combination of the three modes of transfer in selected fields, such as ordinary heat exchangers, regenerators, cooling towers, laminar and turbulent boundary layers, packed columns, and others. The work concludes with a supplement to bring Volume I up-to-date.

The book contains an extensive bibliography, but has the advantage of presenting many of the items in sufficient detail so that reference to outside sources is not necessary in many cases.

The book represents a tremendous amount of work on the part of the author and is a valuable contribution to the heat transfer field. Previous books have been either too sketchy or have made a detailed presentation in a limited field. The present book is thorough in its treatment and can be used as both a handbook and a basic text.

Construction Planning

Construction Planning, Equipment and Methods, by R. L. Peurifoy, McGraw-Hill Book Company, New York 36, N.Y. Price, $8.50.

Mr. Peurifoy wrote this book for those who plan and develop construction projects. It discusses methods, equipment, and costs. Methods for designing projects and preparing specifications are covered and it illustrates methods for establishing more accurate control over the operation and cost of construction jobs.

Construction Planning, Equipment and Methods has complete and enlightening chapters on job planning and management, selecting construction equipment, engineering fundamentals, drilling and blasting rock, tunneling, foundation grouting, pile driving, pumping, cofferdams, production of crushed stone aggregate, concrete, safety engineering, and many others.

The author is professor of Construction Engineering, Agricultural and Mechanical College of Texas.

This book is a valuable asset to the library of the construction engineer.

Propulsion

Aircraft and Missile Propulsion, Volume I and II, by Maurice J. Zucrow, John Wiley & Sons, Inc., New York 16, N.Y. 1958. Volume I: 538 pages; price, $11.50. Volume II: 636 pages; price, $13.00.

The rapid development of engines for propelling guided and unguided winged aircraft and missiles at high speed has prompted the writing of this three-volume work. The first two volumes have just been published.

Volume I, subtitled "Thermodynamics of Fluid Flow and Applications to Propulsion Engines," discusses the underlying principles of the technology involved. The chapter headings include: review of fundamental principles; general characteristics of propulsion systems; thermodynamics of compressible fluid flow; flow through nozzles; and flow through diffusers.

In Volume II, subtitled "The Gas Turbine Power Plant, the Turboprop, Turbojet, Ramjet, and Rocket Engines," Dr. Zucrow analyzes the cycles and performance characteristics of these propulsion engines, devoting an extensive chapter to each. Volume III, now in preparation, will deal with the components of the same engines.

ASME Announces Prize Paper Contest

The Chicago Chapter of the American Society of Mechanical Engineers is now seeking technical papers for its Annual Prize Paper Contest. The contest is limited to Chicago A.S.M.E. Members who are 35 years of age or younger.

Papers should be of a technical nature concerning the contestant's work or interests. Papers of a political, editorial, or advertising nature will not be accepted.

Papers may be of any length. The presentation, however, will be limited to 15 minutes with a 5 minute question period following the presentation period. The papers are first submitted to the judges for preliminary selection where they are graded for contents, composition, reader interest, etc., up to a maximum of 60 points. The top three papers are then graded by the judges at the presentation in March on the basis of audience interest, presentation, etc., up to a maximum of 40 points.

The presentation of the papers will be held before the Chicago Chapter and attractive prizes will be awarded to the top three contestants. The paper awarded 1st place will be forwarded to New York for possible publication in *Mechanical Engineering* magazine.

Submission of papers closes on January 15, 1959 and the presentation of the papers will take place at a dinner meeting to be held on March 4, 1959.

Papers should be submitted to:

Prize Paper Contest
American Society of Mechanical Engineers
84 East Randolph Street
Chicago 1, Illinois

Questions on the papers can be answered by telephoning Joseph P. Ryan, DElaware 7-5252 Extension 254.

Rural Electric Loads In Startling Growth

The startling growth of electrical loads in rural areas has had "a substantial influence" on planning rural distribution lines, it was reported in Pittsburgh, Pa. on Oct. 30.

This planning has come a long way since the first Rural Electrification Administration financed project was energized in 1935, said E. H. Breckenfelder and C. Maxwell Stanley, of Stanley Engineering Company, Muscatine, Iowa, in a paper presented during the Fall General Meeting of the American Institute of Electrical Engineers.

Originally rural planning was for a few feeder lines serving selected customers each using less than 50 kilowatt hours per month. Today there are vast rural electric systems serving several thousand members who each consume 500 to 1,000 kwh or more per month, they said. "Moreover, the upward trend in energy use per customer keeps pace with urban use and averages 6 to 8 per cent per year. These developments have had profound influence on the planning of rural distribution systems."

A little over two decades ago farm electricity use was confined principally to household lighting and appliances, and the early REA objective was an average consumption of 100 kwh. "Now the average monthly usage of residential consumers (excluding commercial and industrial) on REA financed systems throughout the United States approaches 300 kwhr per month. . . . In Iowa this average is now about 450 kwhr per month. On some systems it runs as high as 700 to 800 kwhr per month."

Mobile Processors To Join U.S. Army

Lightweight, mobile electronic data processors will soon become a vital member of the modern U. S. Army, according to a joint Army Signal Corps-Philco Corporation statement.

Designed to meet Army field requirements under combat conditions, the data processors will be used for combat computations, control data processing and support data processing.

A contract for more than a million dollars to design and build the first two mobile data processors has been awarded to Philco's Government and Industrial Division.

Official names for the data processors are Basicpac and Logicpac. Both are basically the same, but the Logicpac will have a larger core storage (memory) and greater input-output capabilities.

These field service computers will be installed in all-weather shelters—11 feet long, 6½ feet wide and 6 feet high—in order to make the units highly mobile.

Outstanding feature of the Philco mobile data processor will be its rugged construction and reliable components to minimize the effect of such enviromental factors as temperatures, humidity, noise, vibration, shock and dust.

Logicpac and Basicpac will be constructed to provide consistent, reliable and error-free operation under severe field conditions.

By logical design, the data processors will be adaptable to a wide range of situations and problems. In an emergency, the basic units can be assembled or expanded into a larger unit.

The basic data processor also will be designed so that most units of Basicpac and Logicpac will be interchangeable and all controls will be standardized.

A stripped, completely operational version of the Basicpac will weigh no more than 175 pounds. It will be designed to handle a variety of combat computations, as part of a larger computer system. For example, the new Philco data processor can be used in an artillery survey system, in a meteorological system, or in a drone aircraft control system. It could also be used for data reduction to reduce the volume of data that must be transmitted to Army field units.

Special, highly compact circuit modules will be used extensively in the two mobile data processors. These techniques were developed by Philco in the production of its all transistor control, scientific and large scale data processing systems.

According to the U. S. Army Signal Research and Development Laboratory at Fort Monmouth, N. J., "Multiple-use electronic data processors being developed for use by Army units in the field will greatly improve the overall effectiveness of combat operations.

"These data processors may be used to provide more timely information to combat commanders and their staffs, make analyses and evaluations previously not feasible and improve the speed and accuracy of service in logistical and administrative activities.

"This in turn may significantly reduce the need for large stockpiles of supplies, material and replacement personnel which frequently restricts the freedom of movement of modern armies and provides the enemy with prime targets.

"In addition, mobile field data processors may directly improve the speed and effectiveness of fire-support by calculating the optimum choice and employment of weapons."

NEC Completes Annual Forum

Volunteer officials of the National Electronics Conference, after recently completing the administration of a very successful annual forum and exhibition, have announced their intention "to continue an active role in researching the best possible means of presenting technical information to the maximum audience."

These were the words of the 1958 president Joseph H. Enenbach, a supervising engineer at Illinois Bell Telephone Company. Enenbach expressed belief that NEC's reputation as the "nation's prestige electronics conference had been upheld in 1958." Attendance was up more than seven per cent over 1957.

"We feel certain that 1959 will establish even higher standards," he said. "Extensive research into our present methods is in progress in this 15th year of our work in an effort to determine the best way to accomplish our obligation to the nine universities and four professional societies which sponsor NEC."

Much of the study along these lines has been prompted by the programming of ever increasing numbers of small, highly specialized conferences, forums and meetings.

A total of 8,609 NEC registrants traveled from coast to coast and from 15 foreign countries to Chicago this year to participate in the technical sessions, to see the commercial exhibits and listen to outstanding luncheon speakers. Engineers topped the list of registrants, followed by men in research, management and sales.

Because of the extreme interest in the Air Force's attempted rocket shot at the moon two days before NEC opened, a special session on this subject was scheduled. Over 500 men filled the Hotel Sherman's Bernard Shaw room to listen to and ask questions of Dr. Robert R. Bennett, Director of Electronics for Air Force Pioneer Space Probe. He narrated the original film of the preparation, firing, and tracking of the Pioneer moon rocket. The film had been declassified especially for the NEC showing.

In addition to the 211 commercial firms with displays, a special exhibit section was arranged with booths by JETS (Junior Engineer Technical Society), the U. S. Air Force, Army Ordnance Department, Naval Research Laboratories and the Department of Commerce's Bureau of Standards.

Luncheon speakers at the 1958 NEC were: Dr. Simon Ramo, president of Space Technology Laboratories, California; General John B. Medaris, commanding general, U. S. Army Ordnance Missile Command, Alabama; and Donald A. Quarles, U. S. Deputy Secretary of Defense, Washington, D. C. Special press conferences for these speakers and four visiting Russian scientists were well attended by the daily press.

Sponsors of NEC are Institute of Radio Engineers, American Institute of Electrical Engineers, Illinois Institute of Technology, and Illinois and Northwestern Universities. Participants are: Michigan, Michigan State, Notre Dame, Purdue, Wayne State and Wisconsin Universities, Electronic Industries Association, and the Society of Motion Picture and Television Engineers.

DON'T FORGET

When the public relations man or reporter contacts you about your new promotion or other good news, be sure to tell him you belong to the Western Society of Engineers.

WHO IS GOING TO BE THE FIRST ENGINEER TO GO TO THE MOON?

We really can't say, but your present WSE Officers, Trustees and Membership Committee wish to initiate a drive to increase your Society's membership by 300 engineers by February 1, 1959.

How can you invite these 300 engineers into Western Society? Your Executive Secretary will send you a package kit of small cards and a brief letter of explanation in the near future. Invite your engineer friends to join WSE by filling in these cards with their names and addresses. Return the cards to Earl Harrington and the WSE Office will do the rest. An appropriate letter of invitation and an application form will be mailed to your friends. Your name will be used as the reference. Your friends will be most grateful to you for making it so convenient to become a member of Western Society and Western Society will gain by your friends' memberships.

The 1958-59 Membership Committee organization is shown on the opposite page. Help them. Contact them by phone. Remember, it is through your invitations to five friends that the drive for 300 more members will succeed.

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MO 4-3442

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130 N. Wells
FR 2-7544 X309

Western Society of Engineers
84 E. Randolph Street
Chicago 1, Illinois

New Products

As described by their Manufacturers

Salamander

This new type Penguin Salamander features an outside return pipe that draws off the inert gases, soot, and unburned material, and returns them to the flame, insuring complete combustion without soot or waste.

This principle results in clean heat with no smoke, and gives more heat per dollar of fuel cost. The "Penguin" is easily lit with a match, and a damper is provided for positive extinguishing. Diffusion of heat in low ceilinged areas is insured by a special hood. The output is positively controlled with a regulator which accurately determines size of fire in the stack. Low initial purchase cost and economy of operation is combined with long life construction, which is of heavy gauge galvanized steel to resist rust and corrosion.

The new Penguin Salamander is now in production, with deliveries being made for use in the construction, agricultural, and industrial fields. Railroads, farms, orchards, foundries, utilities, warehouses, and construction contractors are quantity users of this product. The new "Penguin" produces over 140,000 B.T.U.'s and burns up to 20 hours on one filling, using kerosene or domestic fuel oil.

The unit is 63" in height and weighs 28 lbs. They give instant "spot" heat to any area, and since they are easily moved. the distribution of this heat can be readily controlled. For further information, prices, and catalog sheets, write *Midwest Engineer*, Key 1102.

Air Compressor

What is believed to be the world's largest portable rotary air compressor manufactured to date is now available from the Le Roi Division, Westinghouse Air Brake Co.

The new Le Roi 1200RD2 is a twin-unit rated at 1200 cfm of free air compressed to 100 psi. The large-capacity compressor is ideal for providing air power for large tunnel jobs, pile driving, large-hole quarry drilling, four-drill pipeline rigs, multiple drill shaft jumbos, air drilling in the petroleum industry, or stand-by plant air.

The twin-unit design of two-stage, oil-cooled, sliding vane type compressors, powered by GM 6-71 diesel engines, provides flexibility of cfm output presently not available on units near this size. Mounted on a unit molded steel frame and four 7.50 x 20, 10-ply tires, the 1200RD2 has a fine ratio of weight to cfm of air delivered; dry weight is but 14,700 lbs. Length is 14 ft. 6 in.; height, to top of hood, is 8 ft.; width is 7 ft. 11 in., which is within limits of all existing state highway regulations. It has an 18-foot turning radius.

The twin-unit 1200RD2 operates at rated speeds of 1800 rpm for the compressors and 2000 rpm of the engines. The compressors are coupled to the engines with hydraulically actuated clutches. Each unit has a 100% capacity control which matches air supply to air demands within a pressure range of 10 psi. One combination air receiver-oil separator is used.

Each unit has its own independent controls and can be operated separately for 600 cfm delivery or together for 1200 cfm delivery. The capacity controls are arranged so that each unit modulates separately or the two units modulate simultaneously. This allows one unit to be stopped when air requirements are 600 cfm or lower, or when servicing, without complete interruption of job operation.

The twin-unit design also provides interchangeability of both engine or compressor parts for servicing. These parts are also interchangeable with Le Roi 600 rotary compressor parts.

A stacked arrangement of individually cast cylinders provides ease of inspection, compactness, and maintenance accessibility. Cylinders can be removed separately or with the gear drives as complete units. Vane inspection can be made by merely disconnecting the oil pumps from the high pressure cylinders and the bearing caps from all cylinders. This does not require removal of tanks, receiver, or piping.

Each rotor has double-row ball bearings at the gear-end and roller bearings at the opposite end. This allows "growth" of the shaft and cylinder during temperature variations and stabilizes linear movement of rotor shaft.

Positive gear-type oil pumps are directly driven off the high pressure rotor shafts and are easily removed for inspection through the rear panel. Oil for lubrication and cooling is stored in a reservoir located at the rear of the unit at the lowest point in the oil system.

Radiator-type oil coolers are located immediately ahead of the engine radiators and compressor oil temperature is thermostatically controlled. Manually adjustable radiator shutters aid in quick warm-up of both engines and compressors.

The side panels are full-length, of quick-fold design, and have full-length piano hinges. Side panels and rear panel are equipped with flush-type latches which can be locked when unit is not in use. Fuel and oil filler pipes and air service valves are inside of the lockable, heavy steel metal housing.

Safety protection includes automatic shutdown of engines and compressors in the event of excessive discharge tem-

perature, high engine coolant temperature, or low engine oil pressure. The instrument panels, including all operating switches and gages, are located above the clutch levers, providing one-spot control for each of the twin units.

For more detailed information of the Le Roi 1200RD2 rotary air compressor, write *Midwest Engineer*, Key 1101.

Photo Paper

A new photo-recording paper for oscillograph testing equipment, used in aircraft and guided missile flight evaluations; engine test cell observations of thrust, temperature and pressure; wind tunnel stress, vibration, and acceleration analyses; and other purposes—for seismograph equipment, used in sub-surface geophysical explorations—and for electro-cardiograph equipment; has been developed by Peerless Photo Products, Inc., Shoreham, N. Y., and is now being offered through Peerless distributors from coast to coast in the United States and Canada.

The new paper—Peerless Tru-Graf 1—has a high speed orthochromatic emulsion of medium-contrast which will pick up clearly the fine faint lines of the timing device without overexposure and blurring of the impulse trace.

The product of five years of intensive laboratory research and more than a year of field testing, Tru-Graf 1 is the newest member of the Peerless family of high speed projection papers. It is a worthy companion to Peerless Tru-Stat, the projection paper for stat camera reproduction that has proved so successful.

Tru-Graf 1 is coated on two different paper stocks—Type .005, a standard weight alpha sulphite paper, and Type .003, an extra-thin 100% rag content base with outstanding wet and dry tear strength, good translucency, and excellent folding characteristics. Both papers are matte finished, to take pencil, ink, and ball-point markings clearly.

Tru-Graf is available in a wide range of widths from 5 in. up to 12 in. and roll lengths from 100 ft. up to 475 ft. It can be spooled specially to fit any type of recording camera, including two-ply or dual winding, and with the emulsion *in* or *out*. It processes satisfactorily in any of the commercially available processing chemicals and lends itself perfectly to high speed stabilization processing.

The extensive research behind Tru-Graf has resulted in a product which Peerless claims will measure up in every respect to the stiff requirements of the scientific recording market. These include the ability to withstand staining and cracking, wide latitude in exposure and developing, consistent and dependable uniformity in emulsion speed from roll to roll and over the entire length of each roll, ample contrast to give strong blacks while still picking up the faintest traces, and the ability to contend with large temperature variations in the processing baths.

Literature

Panel Selector

A new two-color, pocket-sized panel selector handbook (1-125PC) has been issued by Federal Pacific Electric Company in conjunction with the introduction of the firm's new and improved line of Stab-lok circuit breakers and enclosures.

Designed to help architects and electrical contractors instantly determine the proper enclosures for a specific application, the 44-page selector handbook gives complete information on Stab-lok enclosures, brief descriptions of Stab-lok circuit breakers, and complete wiring diagrams.

A prominent feature of the handbook is an Enclosure Selector Chart, which provides a simple and quick method for selection of enclosures in terms of the number and types of breakers required.

Covered in detail is every enclosure in the Stab-lok line including load centers, dual rated enclosures, main disconnect panels, split bus panels and meter-socket combinations.

A page is devoted to each catalog item. Contained on it is a diagram showing how the enclosure should be wired for various applications and other pertinent technical data. Knockout locations and dimensions for each enclosure are shown via diagram.

Copies of 1-125PC can be obtained from Federal Pacific Electric Company, 50 Paris St., Newark, N. J.

Foamsil

A four-page folder describing its new insulating and refractory material, Foamsil, is now available from the Pittsburgh Corning Corporation.

The folder contains background information on the unique new foamed silica material which is 99% pure fused silica and has a practical operating range of —450°F to 2200°F. The material is unaffected by practically all commonly used acids and is unaffected by thermal shock.

A list outlining the physical characteristics of the material, along with recommendations for its possible uses, is contained in the folder. Sizes and shapes available are also illustrated.

Copies of the folder may be obtained by requesting Booklet FS-1, Pittsburgh Corning Corporation, One Gateway Center, Pittsburgh 22, Pa.

Consolidation Machine

A table-top, twenty-ton-capacity consolidation machine called the "Levermatic" is described in a new two-page bulletin now available from Soiltest, Inc., 4711 W. North Avenue, Chicago 39, Illinois.

Also described in the bulletin are consolidation accessories such as fixed

type consolidometers, dial indicators, weight set, and specimen trimming equipment.

Medium capacity consolidation frames, as well as high capacity units, are also covered in the bulletin.

The "Levermatic" apparatus is a new laboratory device for testing the load settlement characteristics of soils.

Pipe Schedule Chart

Users of steel pipe will welcome a helpful schedule chart being offered by Midcontinent Tube Service, Inc., Evanston.

It's a 17" x 22" wall chart, printed for top visibility, reproducing all essential pipe-specification information of wall thicknesses, weight and O.D. of seamless and welded steel pipe under ASA schedules from ⅛" to 24".

Because of the large size and clear legibility, the chart can be used on a wall for reference from several feet away — thus avoiding desk clutter. Stiffened top and bottom with metal ferrules, MidcoTube's chart will hang flat on any wall surface.

MidcoTube will send their wall chart to any user of pipe without charge upon request written on company letterhead. Address: Merwin Abrams, Midcontinent Tube Service, Inc., 2120 Lee Street, Evanston, Illinois.

PK-54 Burner

Peabody Engineering Corporation, 232 Madison Ave., New York 16, N. Y. now has available an eight-page, two-color brochure describing their completely redesigned PK-54 Burner. Copies are available on request direct to company. Reference Bulletin 430B.

Insulation

Glass fiber insulation. This new eight page product design brochure illustrates various types of glass fiber insulations, their description, product features, uses, installation, thermal and acoustical performance, standard items and types of facings available. Also included are sections on quartz micro-fibers for high temperature insulation, the advantages and uses of glass papers, plus rovings, textile yarns and mat products. Back cover lists sales offices and services provided by the company. Request form WPD-13, L.O.F Glass Fibers Company, 1810 Madison Avenue, Toledo 1, Ohio.

Empire State Building Honored

The 1,472-foot high Empire State Building, the world's tallest, on Oct. 11 received formal recognition from the American Society of Civil Engineers as "A Modern Civil Engineering Wonder of the United States."

In special ceremonies held at Empire State, Robert Crown, president of the Empire State Building, received a handsome inscribed bronze plaque, measuring 13½ by 17½ inches from Louis R. Howson, MWSE, president of the A.S.C.E. Fred M. Glass, vice-chairman and senior vice-president of the building also participated in the ceremonies along with top officers of the society, including, vice-presidents Waldo G. Bowman, Francis S. Friel, Norman R. Moore, Samuel B. Morris, executive secretary William H. Wisely and Richard H. Tatlow, president of the Metropolitan Section of the A.S.C.E.

In making the presentation Mr. Howson cited the many engineering problems that had to be solved in order to erect a building as arresting as the Empire State and pointed out that today "the Empire State Building stands unmatched as a construction marvel." He noted also that during its construction the Empire State set many records which even today have never been equaled.

Mr. Crown, in receiving the award said: "On behalf of the Empire State Building I accept this award which so truly realizes the sum of the great engineering skills and techniques which created this building. The Empire State Building will ever endure as a monument to American Engineering."

He also announced that the handsome bronze plaque will be permanently installed in the Empire State Building. There it will serve as a companion piece to the commemorative plaque marking the installation of the Empire State Building's famed "Freedom Lights," whose sweep through the night can be seen by residents of five surrounding states.

Coincident with the award presentation, the Society announced that, using the Empire State Building as the master reference point, the first electronic survey of Manhattan Island has just been completed. This new radar-like system, which uses micro waves, shows that from the Battery to the Henry Hudson Bridge Manhattan measures 13.08 miles.

The device, known as a "Tellurometer," through its electronic system required only a two-man crew and completed the task in the record time of three and one half hours, including travel time between points. The actual measuring time consumed ten minutes at each point; two hours and a half were required by the man in the field to travel between the foot of Manhattan and the Henry Hudson Bridge and only 40 more minutes were needed to translate the "Tellurometer" readings. Under the traditional system, which uses a surveyor's transit for a series of sightings along a triangulation network, it would take a four-man crew five days to complete the same task.

To assure an accurate survey, the two-man "Tellurometer" team supplied by Aero Service Corporation, Philadelphia, the largest surveying and map reading organization in the world, checked first from the Empire State Building against a known U.S. Coast and Geodetic Survey reference point on top of Public

School 115 in Canarsie. The U.S. Coast and Geodetic Survey computes the distance as 48,103 feet; by "Tellurometer" the distance is shown to be 48,104.15 feet.

The award to the Empire State Building marked the opening of the week-long annual meeting and convention of the American Society of Civil Engineers there at the Hotel Statler. The meeting, which was held October 13-17, brought together the nation's outstanding civil engineers for a series of formal seminars.

Calling the Empire State Building the "Queen of Skyscrapers," Mr. Howson pointed out that "at first sight the skyscraper appears to be an architectural rather than an engineering triumph." He noted, however, that "it has been made possible entirely by engineering advances. Its steel skeleton is a development from bridge construction and its design, as well as the foundation on which it rests, was entrusted to civil engineers."

Here are some of the records set when the 102-story Empire State was being built:

—The metal skeleton was completed in 23 weeks.

—The masonry was completed in eight months.

—Steel was in place at the building 18 hours after leaving the steel mill.

—The building was completed in one year and 45 days.

—The largest single steel order ever placed for building construction was the 60,000 tons of steel which went into the Empire State.

—The 60-ton, 22-story television tower houses the transmitters of all seven of New York City's TV stations.

—Early in 1956, the four "Freedom Lights," each weighing a ton, were installed on the Empire State Building's four sides at the 90th floor level, 1,092 feet above the street. They were first turned on the evening of May 3, 1956, at ceremonies attended by leading state and city officials as well as celebrities from the entertainment world.

Since its construction the Empire State Building has played host to some 16,000,000 visitors who throng its Observatories on the 86th and 102nd floors from where on clear days they can look out over a five-state panorama. In addition to the visitors there are 16,000 persons working within this 1,472 foot giant.

The Empire State Building is the only one of seven modern wonders named by the society to be financed and built by private enterprise. The others are: Chicago's Sewage Disposal System; the Colorado River Aqueduct; the Grand Coulee Dam and Columbia Basin Project; Hoover Dam; the Panama Canal and the San Francisco-Oakland Bay Bridge.

100-millionth Pound Fabricated at I-T-E

The 100-millionth pound of structural steel fabricated for structures that support electrical transmission, distribution, switching and control equipment, was shipped October 22 by the I-T-E Circuit Breaker Company's Greensburg Division, Greensburg, Pa.

The 100-million-pound mark was reached during fabrication and shipment of a 31,000-pound structure for Northern Indiana Public Service Company's new North Webster substation switchyard at Warsaw, Indiana.

The milestone—celebrated by Northern Indiana Public Service Company, Pennsylvania Railroad Company, and Greensburg I-T-E officials—marked 46 years of unique industry service. I-T-E, a leading producer of outdoor transmission and distribution devices, is the only manufacturer that produces complete structures of every size — from initial design to final fabrication — in its own plant.

In a brief ceremony at I-T-E's loading platform, R. M. Schahfer, vice-president of Northern Indiana Public Service Company, marked the last bundle of steel for shipment to his company as it was lowered into a decorated gondola car to officially acknowledge the event. Before the loading ceremony, officials from the three companies attended a ceremonial luncheon.

I-T-E's 100-million-pound total includes structures ranging in weight from as little as 400 pounds to mammoth structures, weighing almost one million pounds, for an entire substation. They have been shipped to electric utilities in every section of the country.

Starting with a small department of six people 46 years ago, the structures section has grown to a major operation of the Greensburg plant, this department employing more than 100 people and with a total production capacity of 600,000 pounds a month.

In supplying structures, I-T-E provides a completely integrated, packaged job. Starting from basic electrical diagrams and real estate plot plans only, the division designs, details and fabricates all structural parts and thereby has complete control of quality of the entire structure.

I-T-E was also the first manufacturer to build electrical supporting structures of aluminum, and has shipped more than one million pounds of the lightweight metal since 1945. This is equivalent to almost three million pounds of steel structures.

Pioneer in the development and manufacture of electric power transmission, distribution and switching equipment, I-T-E produces power switching equipment and substations, power switching centers, isolated phase bus and distribution switching equipment such as circuit reclosers and cutouts.

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Another Computer Goes to Work

A high-speed electronic computer has been put to work near Chicago to help this country achieve supremacy in the Arctic.

The "brain," a Bendix G-15 general purpose digital computer, was installed at the U. S. Army Snow, Ice and Permafrost Research Establishment (SIPRE) headquartered in suburban Wilmette.

The mission assigned to SIPRE by the defense department includes a scientific exploration of the Arctic because of the possibility of military operations in or over areas where snow and ice abound. Seasonally, snow, ice and frozen ground cover up to one-third of the earth's land surface.

The mission of the versatile G-15, manufactured by the Computer division of Bendix Aviation Corporation, is to help speed SIPRE research findings to keep up with the needs of the armed forces for this vital information.

Dr. Henri Bader, chief scientist at SIPRE, said the services of a modern electronic computer also will enable SIPRE to launch new scientific projects that might not have been undertaken previously because of the complicated mathematics involved.

SIPRE has been instructed by the chief of engineers to use research as the means to a faster solution of the practical problems facing the soldier operating in northern regions.

These problems include relief and rescue operations, disruption of enemy operations, camouflage, deception, detection, layout of camps and bivouacs, and use of snow and ice for water supply.

A major SIPRE contribution to national security was the selection and development of airstrips on sea and lake ice in connection with the construction of the DEW line, the northernmost radar network which stretches 2,500 miles across the Arctic to protect the North American continent from surprise attack.

Current SIPRE experiments include the construction of airstrips of compacted snow to determine their air operational capabilities.

SIPRE also is experimenting with tunnels and chambers in the Greenland icecap. The chambers could be used as undersnow storage rooms and as subsurface radar stations and living quarters. Tunnels could become snowy subways for trains, trucks and jeeps operating away from the severe wind and linking Arctic outposts.

SIPRE, which was formed March 5, 1949, is regarded as the free world's authority on snow, ice and frozen ground (permafrost). It is administered by the U. S. Army Corps of Engineers, and it serves as a clearing house for all available information on the subject.

Its staff of outstanding scientists and technical personnel includes more than 35 physicists, geologists, glaciologists, meteorologists, engineers and statisticians.

Most members of the scientific staff have had years of experience in polar regions, mainly on the huge and strategically important Greenland icecap.

Many of them, Dr. Bader said, will be trained to use the Bendix computer to accelerate the analysis of field and laboratory work.

Simulated Reactor

The Merchant Marine is learning how to operate a nuclear powered ship by means of a simulated reactor, it was revealed Oct. 30 in Pittsburgh, Pa., at the Fall General Meeting of the American Institute of Electrical Engineers.

The simulator "is a useful tool for training operators" without the necessity for travel to a remotely located reactor installation, N. E. Bush, of Westinghouse Electric Corp., East Pittsburgh, told a nuclear power symposium.

The instrument has been designed for the Maritime Administration to simulate the nuclear power plant of the merchant ship *N. S. Savannah.*

The simulator consists of an electronic analog computer, an instructor's desk and the operator's console. The computer, he said, is the heart of the instrument as it solves the mathematical equations which describe the reactor plant and its control system. The machine also can be used for reactor operator qualification tests, and for testing changes in plant system and instrumentation, he said.

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All-Aluminum Refrigerator Cars

What are believed to be the world's first five all-aluminum refrigerator cars are now in service with the Canadian National Railways. Designed by the C.N.R., Aluminum Company of Canada, Limited — principal subsidiary of Aluminum Limited—and National Steel Car, and built by the latter. They are 22.5 percent lighter than previous refrigerator cars and each one saves 14,200 pounds of weight.

With the exception of the trucks, charcoal heater, door and hatch hardware and certain safety equipment, all parts of these five cars are of aluminum construction. The purpose of this extensive use of aluminum is primarily to eliminate expensive and frequent repairs and repainting due to corrosion by brine solution used in the refrigeration system on existing equipment. The roof, side sheets and ends of the five cars have been left in the unpainted condition. A reduction of over seven tons in the weight of the car will reduce the rolling resistance.

Prior to this, in Canada, the United States, and Germany, aluminum has been used for roofs, interior and, in one experimental case, outside sheets of the car.

The five prototype units will be subjected to an extensive testing program. Four cars are now in service with the C.N.R. and are being closely watched in normal service conditions. The fifth car was equipped with strain gauge during construction and is to be used for a static road test, the first of a series of four tests. Strain gauge readings and deflections will be recorded for various conditions of road, both on the meat rack and on the floor. This test will be followed by a road test where strain gauge reading will be recorded to indicate the stress levels encountered on the car during operation.

On completion of the road test the car will be sent to Aluminum Laboratories, Limited, in Kingston, Ontario, Aluminium Limited's research affiliate, where a fatigue test will be undertaken and will be reproduced. The last and final test will be a series of impact tests.

On completion of these tests the results will be analyzed and compared with the stress analysis which preceded the design. Areas of overdesign and the reverse can be corrected in future cars. It is expected that this test program, which is more extensive than any previously carried out in North America, will eliminate the customary service testing requirements by the railroads of five to ten years on new equipment.

Throughout the testing C.N.R. mechanical and research personnel and Aluminium Laboratories personnel, will be working together to obtain the maximum amount of information from this program.

The new refrigerator cars bear certain special features which are creating wide interest in the North American industry. These are specifically:

—All-welded aluminum floor with curved inside side sill section to facilitate cleaning.

—Aluminum brine tanks equipped with drain tubes leading to air-tight drain traps to feed brine overflow directly from car.

—Two cars only—improved type of aluminum meat rack.

—Improved insulation due to reflectivity of aluminum sheet.

—Increased thickness of insulation throughout.

—Composite riveted and welded aluminum underframe.

Fission Product Study

Vitro Laboratories, a division of Vitro Corporation of America, has been awarded a contract to investigate the chemistry of long-lived radioactive fission products by the Atomic Energy Division of Phillips Petroleum Company.

Principal objective of the research program is to aid in developing safe and effective storage methods for "hot" fission products. The products to be stored are the radioactive "ashes" which result from the burn-up of nuclear fuels such as those in the Material Testing Reactor and the Engineering Test Reactor.

The results of this work may prove important to control of radioactive wastes from America's future nuclear power plants.

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C-7004 CHIEF DESIGN ENGR. ME or EE: 3+ yrs. in design & engrg. for production of electro-mech. mechanisms & products. Exper. in switches, relays & allied product fields desirable. Duties: Will report to Gen'l. Mgr. & be resp. design & devel. of new products & allied lines & redesign of existing products for a mfgrer. of electric switches sal. $11,000+ dep. on exper. loc. No. Ind., employer will pay the fee.

C-7015 INDUSTRIAL ENGR. Engrg. Degree (may be ME, EE or IE) age 30-40; 3-4 yrs. industrial engrg. exper. with emphasis on estimating, tooling & processing at medium-sized metal mfg. plant. Previous exper. with mfgrer. of pneumatic or mech. controls desired for a mfgrer. of controls sal. ro $650 mo. employer might negotiate the fee.

C-7012 PROJECT ENGR. Grad. EE age to 40; 5+ yrs. exper. in design & installation of hvy. industrial elect. eqpt. Duties: At project level field & in office on design, layout & installation of hvy. elect. eqpt. Should be able to handle personnel, also purchasing of motors, wiring, fittings, eqpt. etc. for consultant sal. $4-4.25 hr. loc. Chgo. employer will pay the fee.

C-7007B MECH. DESIGNER, ME, EE or equiv. age to 35; 2+ yrs. in design of heating, ventilating, air cond., plumbing & elect. systems for bldgs. of all types for an arch.-engrg. firm, sal. to $750 loc. 40 mi. S.W. of Chgo. employer will negotiate the fee.

C-7003 MACHINE DESIGNER BSME degree pref. 5-10 yrs. exper. Duties: Supv. tool & machine designers; general machine shop in high voltage switches & fuses, special eqpt. for a mfgrer. sal. $8-10,000 loc. Chgo. employer will pay the fee.

C-7107 VILLAGE ENGR. Grad. CE age to 30; 2+ yrs. exper. in general municipal work, knowl. of bldg. codes helpful. Duties: Assist in bringing up to date utility & subdivision maps gen'l. office & field work as village engr. in rapidly growing western suburb, sal. abt. $7200 employer might negotiate the fee.

C-7109 CHIEF PRODUCT DESIGN ENGR. Grad. ME age to 45; 5+ yrs. in heavy mach'y. design & devel. Duties: Head up engrg. dept. on design & devel. for mfr. of earth-moving eqpt. Good potential. sal. $12,000 loc. Ill. employer might negotiate the fee.

C-7110 CHIEF ENGR. ARCHITECTURAL BS pref. Arch. age 30-40; 5+ yrs. architect. engrg. or construction exper. Duties: Supv. of entire arch. engrg. dept., some sales engrg. for a mfr. of arch. porcelain enamel, sal. $8-10,000.

C-7115 CONTRACT DIVISION MGR. Age to 39; 5+ yrs. exper. incl. supv. of others & ideally some sales, cost est., planning & supv. performance of elect. contacts. Duties: Under direction of Pres. obtain bid requests, submit bids, follow proposals, secure all data necessary to bid & carry out contracts incl. approval of methods, materials & billing procedures, maintain relations with engrs. arch. & contractors, planning, scheduling & coordinating performance of contracts. Supv. & coordinate activities of engrg. & field supv. Good oppor. for advancement in salary & opportunity for eventual top mgmt. position & possible ownership interest, for an elect. contractor sal. $8-10,000 loc. Ill. employer might negotiate the fee.

Engineers Available

915-MW: MANAGEMENT, ADMINISTRATION, EXECUTIVE 39 BSCE Registered NY, Wis., La. construction supt. (last project budgeted at 30 million dollars) comm. pilots license. Have held positions as supt. of construction, resident engr., director of public works. Desires job w/opportunity in mgmt. or administration sal. $9-1000 mo.

917-MW: DESIGN & DEVEL. ENGR. Diversified knowledge of production methods pertaining to mfr. of electro-mech. eqpt., consumer goods, metal working, fabrication, plastic industry, job shop, diecasting foundry operations. Strong practical background in all tooling areas. Presently resp. product & production design & coordination of cost & quality control program $12,000 Chgo.

918-MW: ESTIMATOR - EXPEDITOR or TECH. WRITER 33 BSE Univ. of Mich. with add'l courses in steel design; 5 yrs. with gen. contractor Detroit additional 2 yrs. with gen. contractor Chgo. most recent 3 yrs. with large steel fabricator in Chgo. area (female) $6-6500 Chgo.

Wonder Designs Moon Building

Plans for a permanent "moon building" to house living quarters for moon explorers, laboratories for scientific research, maintenance shops for space vehicles and stations for earth-moon communications have been announced by the Wonder Building Corporation of America, Chicago.

A detailed 5 by 6 foot scale model of the structure—a cigar shaped corrugated metal cylinder covered by a protective metal "meteoric shield"—was recently unveiled to military and federal government officials at a presentation in Washington, D.C.

The moon building was designed and engineered by the Wonder Building Corporation under the technical direction of Dr. John S. Rinehart, professor of Mining Engineering and director of the Mining Research Laboratory, Colorado School of Mines, and former associate director of the Smithsonian Astrophysical Observatory, Cambridge, Mass.

Dr. Rinehart said that because of the present lack of knowledge and great divergence of opinion concerning the moon's surface, the moon building has been designed for the worst condition anticipated—a sea of dust upon which the building would float, anchored by heavy weights suspended by cables from the body of the structure. If the moon's surface proves to be sufficiently solid, it could then provide normal support for the building.

Building's Size

In actual size, the moon building would be 340 feet long, 160 feet wide and 65 feet high. Including air lock and plastic observation bubble, it would measure 520 feet in length. The building would be fabricated of aluminum alloys which combine high strength and low weight with ease of fabrication. Aluminum also provides a good reflecting surface which aids cooling problems.

Above and separated from the roof of the building is a slightly curved umbrella-shaped protective meteoric shield, designed to ward off the gnatlike rain of interplanetary meteoric dust which descends with great velocity on the barren surface of the moon. The shield would be 460 feet long, 380 feet wide and 83 feet high.

The entire shell of the building, and the protective barrier, would be fabricated of pre-engineered metal sheets secured by simple nut and bolt fasteners and welded structural connections. A unique "Truss-Skin" design developed by the Wonder Building firm provides completely useable interiors, without internal supports of any kind.

With space at a premium inside the moon building, the trussless concept would eliminate space wasted by ordinary structural supports, while the pre-engineered design would permit quick erection with minimum labor and tools.

Inside Building

—Living quarters, including rooms for sleeping, cooking, eating, and recreation.

—Physics, chemistry and biological laboratories.

—A control tower for communication, meteorological studies, earth observations, astronomical observations, traffic control, etc.

—Air conditioning, heating, power and refrigeration plants, oxygen producing units, extreme-temperature regulating devices, water supply and sewage processing plants.

—Machine shop and equipment maintenance areas.

Entrance to the moon building is made through an air-lock at one end, adjacent to which would be constructed a rocket landing area. Complete internal pressurization of the hermetically-sealed building provides an air pressure of at least 10 pounds per square inch, close to earth's normal atmospheric pressure of 14.7 pounds, the same as pressure used in high altitude airliners.

Special refrigerating and heating plants cope with the extreme temperatures and tremendous temperature gradients which abound on the moon. Day and night on the moon are about two weeks long, with temperatures at lunar midday reaching 214 degrees F; at sunset, 32 degrees F, and at midnight, —243 degrees F.

There are no windows in the moon building, since ultraviolet radiation, normally absorbed by tne earth's atmosphere, would be sufficiently intense to render panes of glass or plastic useless through discoloration. Metal shutters protect the plastic observation bubbles.

Wonder Building Corporation of America, which undertook development of the moon building in October, 1957, following launching of the first Russian sputnik, is one of the nation's major manufacturers of pre-engineered metal buildings. The firm's long experience in pre-fabrication techniques led to their interest in designing the moon building, a structure which would necessarily have to be transported in small sections, with no single piece larger than the load-carrying capacity of future moon rockets.

Dr. Rinehart estimated that man could establish a building on the moon in ten years.

New Vehicle

A new vehicle developed for the Army weighs only 900 pounds, yet can carry payloads up to 1,000 pounds, reports *Product Engineering*. The extensive use of light metals includes an aluminum engine and magnesium platform. Air cooling cuts the weight of the engine and balloon tires eliminate all springing. A driver's seat is provided, but a jointed steering wheel permits the operator to walk or even crawl behind the moving vehicle.

WSE Applications

In accordance with Article I, Section 5 of the By-Laws of the Western Society of Engineers, there is published below a list of applicants for admission received since the last issue of the Midwest Engineer *magazine.*

James B. Neighbor, Manager, Sales Dev., Chicago Pump Company, 622 W. Diversey Pkwy.

J. Burnham Maylard, Owner's Representative, Kemper Insurance Building, 20 N. Wacker Dr.

Howard Hill, Commercial Engineer, Commonwealth Edison Company, 1701 S. First Avenue, Maywood, Ill.

John Kowal (Rein.), Supervising Engineer, Illinois Bell Telephone Co., 208 W. Washington St.

Theodore A. Cohen (Rein.), Chief Engineer, Regulet, Inc., 831 S. Wabash Ave.

Ronald Fues, Project and R. & D. Eng., Janette Electrical Manufacturing Co., Morton Grove, Ill.

David S. Clark, Vice President, Emerson-Comstock, Inc., 130 N. Wells St.

E. W. Beck, Jr., Manager, Indust'l Constr'n., Edward Gray Corp., 12233 Avenue 'O'.

Miguel A. Clare, 4072 N. Sheridan Rd., attending Chicago Technical College.

George B. May, Mechanical Engr. GS-7, U. S. Army, Corps of Engineers, Merchandise Mart.

Beaver Nappers

Canadian construction men are planning some mass beaver-naping after losing three battles to a colony of 30 amphibious rodents, reports *Engineering News-Record.* Three times, construction men tore down a beaver dam to relieve flooding of a quarry. Each time the beavers repaired the gap in their home. Now the men plan to kidnap the busy beavers and let them do their dambuilding elsewhere.

Smart Crane

A cargo crane that will automatically select a loading site on board the ship, now is being built, reports *Control Engineering.* This will solve the problem of the crane operator who cannot see the cargo after it has entered the ship's hold.

Solution to Smog Problem Nears

Dr. W. L. Faith, managing director of the independent Air Pollution Foundation, said on Nov. 12 that two more years of Foundation work can wind up all the remaining basic research needed for final solution of the Los Angeles smog problem.

Faith made this report to Foundation trustees and contributors at the privately-supported scientific research organization's Fifth Annual Luncheon Meeting at the Statler Hilton hotel in Los Angeles.

"We fully believe that two more years of intensive scientific work under Foundation auspices can provide all the essential facts, so that private industry can take over from that point and produce workable, economic controls for auto exhaust and thereby eliminate smog," he said.

L. A. Smog Different

Faith also emphasized in his annual report that smog in Los Angeles and other population centers on the West Coast is not the same kind of air pollution as that troubling most other metropolitan areas of the country.

Faith cautioned against hopes that the Federal government will be of any great assistance in ridding the West Coast of its "photochemical smog."

"There is a tendency in some quarters to foist this job on the Federal government," he noted.

"Suggestions of this sort are based on the notion that a device that will settle the Los Angeles problem will be equally applicable in other areas. This is a questionable assumption.

"The low-inversion, low-wind, intense-sunshine regime necessary to develop eye irritation from auto exhaust seldom occurs in areas other than the West Coast. Any Federal bureau studying auto exhaust would be obliged to study its nationwide aspects and to keep the Los Angeles problem in proper relationship to the whole."

The most common air pollution complaints elsewhere in the nation, Faith reported, are visible smoke and disagreeable odor of exhaust, particularly from buses and trucks; potential hazards of carbon monoxide and nitrogen oxides, and suspicion that auto exhaust contains compounds that may induce lung cancer.

"These complaints pose exhaust control problems that are not identical with the auto exhaust problems we are dealing with in our efforts to control photochemical smog—Los Angeles' eye irritation, high ozone concentrations, blurred visibility and plant damage," he explained.

"Accordingly, the solution that will finally be accepted in Los Angeles and for the West Coast may not apply in other communities."

A First Time

The Foundation meeting marked the first time that any scientist has declared flatly how much more basic research is still required on Los Angeles smog and how long it will take. Faith is a chemical engineer. As managing director, he reported the conclusions reached by the Foundation's full scientific staff during recent months.

He said the estimate that two more years will complete the basic research

phase of the smog problem "is based on the questions we know must yet be answered about exhaust reactions in the atmosphere, our experience with the number of experiments usually required to answer such technological questions, and an assumption that continued adequate funds will be forthcoming for two more years' intensive effort."

During its five years of basic research, the Foundation has operated on contributions averaging slightly over $500,000 a year, subscribed by industrial, business, financial and professional firms, trade associations, and individuals.

"The kind of intensive effort we have in mind," Faith said, "will have to be initiated by the Foundation and paid for by the Foundation for three specific reasons:

Three Reasons

"First, there is no other private research organization that is committed to use its resources for solution of the smog problem.

"Second, there is nowhere in the country any single laboratory or scientific institute that has the total facilities needed to conduct all the work still required — several, perhaps many, will have to be contracted with by us to do specific jobs.

"Third, no governmental agency has the freedom of action to cut off unproductive work quickly, which is frequently necessary in working toward speedy solution to the smog problem."

Keystone of the Foundation's immediate basic research plans is the relationship between the nitric oxide in auto exhaust and certain olefins in exhaust—neither of which, Faith emphasized, is directly related to the gasoline used in an auto. Most of the work will be done in the Foundation's smog chamber at the Stanford Research Institute facility in South Pasadena.

Reiterating that successful control of auto exhaust will mean an end to the photochemical smog still plaguing the West Coast, Faith said "any plans of the Los Angeles County Air Pollution Control District to control solvent emissions should be carefully reviewed."

"Present indications are that solvent vapors are not sufficiently reactive to form smog—not only because they are nonolefinic, but also because they never become mixed with the proper nitrogen oxide concentrations," he said.

Faith added that the Foundation "expects to get further information concerning this reaction in our smog chamber during the next year" along with its intensified basic studies on auto exhaust.

Babcock & Wilcox Makes New Proposal

Two radically new approaches to the problems of high nuclear fuel, equipment and design costs, which have thus far prevented the atom from competing with conventional energy sources, were proposed in New York by The Babcock & Wilcox Company.

The first concept introduces the use of mixed "light" and "heavy" water—or water of variable density—to control pressurized and boiling water reactors. This system would replace the costly and intricate control rod systems now widely employed. In addition, the company estimates that this new control method will "more than double" the useful life of a water reactor core and increase the efficiency of fuel consumption up to 30 per cent. Another advantage of the concept is that equipment costs can be reduced since it will be possible to extract up to 75 per cent more heat from a core of a given size.

To build a reactor core which will have a long life span, B&W nuclear specialists explained, it must be loaded with considerably more fuel than is actually required to achieve a chain reaction. This extra fuel is then available to be "burned" to produce heat, power, or both. When burnup has reduced the amount of fuel in the core to the minimum required for a chain reaction, the core can no longer produce heat and must be replaced.

The fuel placed in the core for burnup, they stated, is used up less efficiently if control rods or other "nuclear poisons" are employed to counteract the "reactivity effects" of the extra fuel. The new method, they continued, provides a positive control medium which not only promises to achieve a low fuel burnup rate for the amount of heat produced, but also permits larger amounts of extra fuel to be added to nuclear cores. This makes possible a longer-burning and more efficient reactor fuel cycle.

As a result of the second research project, the company has developed a new high temperature reactor coolant consisting of fine particles of solids suspended in gas. The new low pressure coolant, B&W engineers claim, "points the way to competitive nuclear power through remarkable reductions in both size and capital cost of major components of nuclear steam generating systems."

While results of these research projects have exceeded expectations, B&W reported, additional study will be required before the findings can be utilized in the production of power.

Better Mufflers

The second change in auto mufflers after years of stagnation may come close on heels of the first, reports *Product Engineering*. After introduction of anti-corrosive coated steel elements on the 1959 models, at least one company now has come out with a stainless steel muffler. The muffler, it is claimed, can be made considerably smaller than standard types and produced in stainless steel at a competitive price with the coated steel models, if not with the old bare-steel models.

Electronic System is "Watchman"

Chief watchman at the giant Southdale Shopping Center in suburban Minneapolis, Minn., is a unique, cost-saving electronic security system which enables a 10-man protection force to maintain an effective 24-hour check on every corner of the 800,000 square-foot, $20 million center.

Stationed at a central communications and nerve center, a single guard can instantly detect fire or burglary in any of the area's 70 stores and shops, and immediately direct police or fire-fighters to the spot. He also can operate all exit doors, lighting, a public address system, and internal security communications in the vast, two-level building which encloses the entire shopping area.

More than 1,200 electronic "eyes" and "ears" — inconspicuous photo-electric cells which can spot a robber's bouncing flashlight or a flickering flame; ultra-sensitive rise-of-heat indicators; and two way loudspeakers which also "listen" for suspicious noises in the dead of night, are part of the extensive security network.

Three years in development, the $100,000 "electronic watchdog" was created and designed by G. Rush Willet, head of G. R. Willet & Company, Chicago telecommunications engineers and consultants. Willet worked closely with Southdale's architects, Victor Gruen & Associates, and Larsen & McLaren, in planning the installation, and with Elgin Metalformers Corporation, of Elgin, Ill., to conceive and develop a suitable control housing based on the firm's modular enclosure concept.

According to Willet, the network, first of its kind ever made, operates on a low voltage electrical system which required no expensive electrical conduit for installation. Its electronic detection devices are so efficient—even checking their own circuits for wiring defects—that no water sprinklers are needed throughout the modern shopping area, affecting a further enormous saving on construction and also insurance costs.

Console is Nerve Center

Focal point of the protection system is a novel, extensively equipped, 30-foot control console, which utilizes industry's first complete modular enclosure system, developed by Elgin Metalformers Corporation. The highly flexible control unit was assembled simply by joining together standard Emcor frames, panels, and component parts much in the manner of building blocks. Use of mass-produced, standardized Emcor units in this manner eliminated the need for much costlier custom-made enclosures.

The "building block" control console assembly also simplifies problems of future expansion of the system as new stores are opened. Easily removed front, top, and back panels make possible quick changes in the electrical programming and circuitry as an additional security measure.

The versatile Emcor Modular Enclosure System was developed to permit industrial and research engineers to work out an infinite variety of individual enclosure plans. It is used widely to house electronic controls, equipment, and instruments in the nation's missiles, automation, research, and communications industries. Similar units house intricate computers, airplane instrument landing control units, missile tracking consoles, and automation controls in industrial plants.

In using Emcor Modular Enclosures, Willet was able to concentrate and group 1,800 electrical circuits and a mass of control equipment into a single, integrated, and inter-connected control desk. Human engineering features of the modular design bring all equipment within easy reach and sight of the guard stationed at the control unit.

In actual appearance, the control console is a desk-high unit toped by slanted turrets along its entire length. The turrets house all the communications switches and signal lights. They are designed by Elgin Metalformers to provide a low silhouette, permitting full view of the area in front of the office so that visitors can be recognized well before they arrive at the nerve center. Extended work-writing arms, attached to each individual frame for maximum strength, form a spacious full-length desk surface.

A separate row of turrets, slanted downward, are located on the ceiling above the control desk. These units house glass panels which light up automatically to report the opening of any outside door in the center.

Personnel on Duty

Protection personnel are on duty at all times at the control console, ready to act on any signal given by the network.

With 500 of the light-detecting "fire-eye" cells set strategically in the ceiling throughout the shopping center and hooked up to signal lights on the control unit, guards can tell the location of any flickering light the instant it appears. Automatic controls reduce the sensitivity of the cells in the daytime. Nevertheless, they can detect a flame of only three inches in diameter in a fraction of a second. Complete control of all lighting at night — creating a perfect blackout throughout the area — assures instant detection of any unauthorized light, even the spark of a cigarette lighter.

Rise-of-heat indicators in 200 locations throughout the building record any dangerous rise in temperature, including heat from smoke, gas, or steam, and send out simultaneous fire alarms to the control unit and the local fire department.

Southdale also is equipped with 500 "talk back" loudspeakers which provide music for shoppers during the day, and when all is quiet, at night serve as lis-

tening posts capable of relaying the most minute sounds to the central office.

In addition, 100 red security telephones, hooked up to the control desk, are used to receive messages from guards on patrol, and to identify authorized after hours visitors to the shopping area.

From the control unit, all exit doors also are controlled. Any attempt to force an outside exit trips an alarm, both at the console and at the local police station. Once a visitor is admitted at night, his path is lighted automatically through the corridors by the guard operating the lighting system. Straying from the path places the visitor in total darkness where the electronic detectors are "watching."

Southdale is wired for future use of closed-circuit television. Eventually, all shops, customers, and even the parking area may be observed at all times from the central protection office.

Chicago Selected For Corrosion Study

Chicago is one of eight cities selected for a corrosion study program which United States Steel has established so that the corporation's sales personnel can actually show prospective customers the superior anti-corrosion qualities of stainless steel and USS Vitrenamel for exterior building application.

Varying climates, geographic distribution and atmospheric conditions are some of the factors that led to the selection of Chicago and the other seven cities—New York, Seattle, San Francisco, Los Angeles, Houston, Birmingham, and Washington, D. C.

The new corrosion study locations will augment a program which, in the past 30 years, has led to the exposure of more than 30,000 specimens of 850 different steels. The popularity of steel among architects and builders for exterior uses led to the expansion of U. S. Steel's corrosion study program.

Rooftop installations of specially constructed racks are being installed in the selected cities. In addition to various types of steel and Vitrenamel, competitive metals used in building construction also will be mounted for comparative studies and customer appraisal. The rack in Chicago is located atop the 208 South LaSalle building.

Jaywalking was costly in the U.S. last year—2,600 were killed.

Aircraft Telephone Service Envisioned

The prospect of telephone service between the ground and aircraft in flight from the East Coast to 100 miles west of Chicago was envisioned in Pittsburgh, Pa. on Oct. 30.

The telephone "corridor" would be 200 miles wide, L. M. Augustus of the Michigan Bell Telephone Company, Detroit, said in a paper, Public Air-Ground Telephone Service Trial, in which he described ground-aircraft telephone experiments now under way at Chicago and Detroit.

Several problems remain to be solved before the Chicago-New York service can be inaugurated, he said. A suitable band of frequencies is a prerequisite. Frequencies between 100 and 500 megacycles would have important advantages over higher frequencies, such as earlier availability of equipment, lower cost and better radio propogation characteristics. He said that an estimated 40 to 50 frequency modulation channels will be necessary to provide "adequately for the traffic which will develop in the next 8-10 years."

The current trial has been supported enthusiastically by the aviation industry, he said, and has been authorized by the Federal Communications Commission.

"An immediate need exists for the present service not only to be continued but extended to cover the more important airlanes. The Bell System has therefore, on March 31, 1958 petitioned the F.C.C. as a first step to extend the service to the east. The service would then cover cities originating one-third of all commercial air travel in this country and more than one-fourth of all private flights. We believe that adding three stations near Pittsburgh, Washington and New York will provide a coverage corridor 200 miles wide extending from 100 miles west of Chicago to the East Coast."

Ground to plane telephone service was inaugurated a year ago in coastal cities, utilizing ship-to-shore equipment, but the service is unsatisfactory in many respects and does not include inland territory, Mr. Augustus said.

Long Tunnel

The Japanese recently opened the world's longest undersea tunnel which is actually a double tunnel, says *Engineering News-Record.*

Obituaries

Western Society recently learned of the passing of Howard Logan. Mr. Logan, who had been a Life Member of the Society since 1939, died in Springfield, Illinois.

Until his retirement several years ago, Mr. Logan had been associated with the Austin Company of Chicago. The Society on behalf of its entire membership wishes to extend sincerest sympathy to Mr. Logan's family.

Fletcher Heads United Engineering Trustees

Andrew Fletcher, president of St. Joseph Lead Company, on October 28 assumed the additional responsibilities of president of United Engineering Trustees, Inc.

United Engineering Trustees, Inc. was incorporated in 1904 for the purpose of advancing the engineering arts and sciences. Its Board is composed of three representatives from each of the five professional societies representing the major branches of engineering — mechanical, civil, electrical, mining, and chemical. Among other activities, the Corporation directs the research programs of the Engineering Foundation, which is financed by a fund of over $2,000,000, and also acts in a fiduciary capacity for a large number of joint activities of the major engineering societies.

United Engineering Trustees, Inc. has purchased the block front between 47th and 48th Streets on the United Nations Plaza for the construction of a 20-story Engineering Center, the cost of which is roughly estimated at $10,000,000. Their present home on West 39th Street will be sold, and the Engineering Societies Library will move into the new Center.

Mr. Fletcher is a past-president of the American Institute of Mining, Metallurgical, and Petroleum Engineers, and in 1957, was awarded the Charles F. Rand Gold Medal of that society for "distinguished administration in nonferrous mining and metallurgical enterprises." He is also chairman of the Industrial Hygiene Foundation of America, vice-president and treasurer of the American Mining Congress, and past-president of Lead Industries Association.

Fletcher succeeds Walter J. Barrett of New Jersey Bell Telephone Company who has been president of UET since 1955 and who is also the retiring president of the American Institute of Electrical Engineers.

Other Officers elected by UET are: George W. Burpee and Willis F. Thompson, vice-presidents, Charles B. Molineaux, treasurer, and Steven W. Marras, secretary-general manager.

Mr. Fletcher prepared for college at the Hill School, Pottstown, Pa., and was graduated from the Sheffield Scientific School, Yale University, in 1916. He received an honorary engineering degree in 1949 and honorary degrees of law in 1953 and 1957.

After a year in the Harlan and Hollingsworth shipyard at Wilmington, Delaware, as a mechanic, he went to Baltimore, Maryland, as a foreman for the Baltimore Dry Dock Co. In 1918, he became Secretary of the W. & A. Fletcher Company, Hoboken, New Jersey, and in 1924 was in direct charge of the business until the shipyard was sold to the United Dry Docks, Inc. In 1929, he gave up his connection with the shipbuilding industry to become vice-president and treasurer of St. Joseph Lead Company. He became executive vice-president in 1946 and president in 1947.

In addition to directorships in St. Joseph Lead Company, Mine La Motte Corporation, Bonne Terre Farming and Cattle Company, Meramec Mining Company, and Missouri Illinois Railroad Company, Mr. Fletcher is a trustee for the Engineering Foundation, Societe des Mines de Zellidja, American Zinc Institute, and American Bureau of Metal Statistics.

Fletcher is a member of Society of Naval Architects and Marine Engineers, Yale Engineering Association, Mining and Metallurgical Society, Institute of Metals (London), and Australasian Institute of Mining and Metallurgy (Melbourne).

Management Methods Meeting Scheduled

Use of modern management techniques to achieve growth and improve operations will be the subject of a meeting of industrial management representatives at Illinois Institute of Technology on Feb. 5 and 6, 1959.

The meeting, called Industrial Management Engineering Conference, is being sponsored by the Industrial Engineering Department of Illinois Tech, the Engineering Economics Department of the Institute's affiliate, Armour Research Foundation, and the National Center of Education and Research in Equipment Policy.

The conference will include discussions on forecast in sales, preparing budgets, quality control, cost considerations, engineering economics, launching a new product, market surveys, wage incentives, operations research, data processing, new site selection, human engineering, production and inventory planning, automation, research and development expenditures, and new product selection.

The meeting will be held in Illinois Tech's Metallurgical and Chemical Engineering Building at 10 W. 33rd St.

Conference chairman is LeRoy A. Wickstrom, instructor, Industrial Engineering Department of Illinois Tech and associate analyst in Armour Research Foundation's Engineering Economics Dept.

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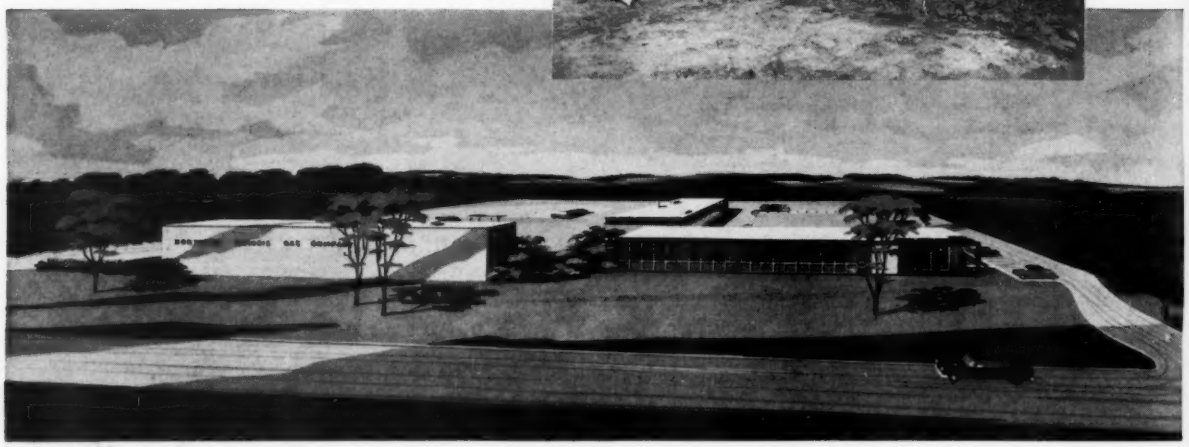
Western Society of Engineers

84 E. Randolph Street

Chicago 1, Illinois

The Start of Another NEW GAS HEADQUARTERS

Ground was broken recently for our new Lake District Headquarters in Crystal Lake by (left to right) A. B. McConnell, of Woodstock, State Representative; Marvin Chandler, Northern Illinois Gas Company President; and Leo Krumme, Mayor of Crystal Lake.



We're matching the progress and development of northern Illinois with new and expanded gas facilities. Lake District Headquarters, under construction on Illinois Highway 176 about 1½ miles east of U.S. Highway 14 in Crystal Lake, is part of our continuing program to bring our customers the best possible natural gas service. It will be the third new headquarters to be built since 1956. Like the others, it will have the most modern facilities, including gas air conditioning, for efficient operations. In the Lake District, also, centralization of our activities will make for even better service in all sections of this fast-growing area about 40 miles northwest of Chicago. Lake District Headquarters is one of many important projects in our five-year (1958-62) $141 million construction program throughout northern Illinois.

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